This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

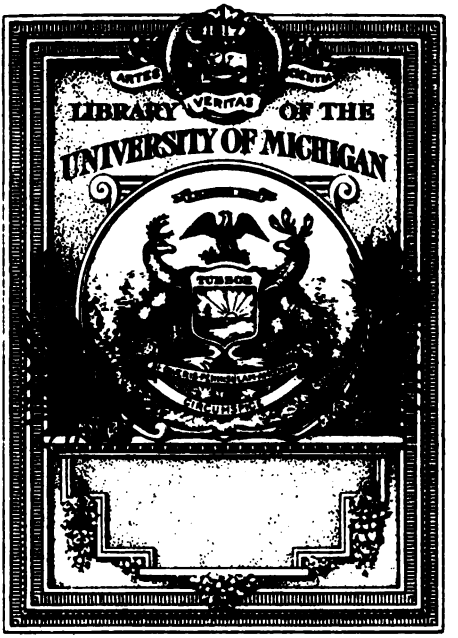
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



RECEIVED IN EXCHANGE
FROM
N.Y. Public Library

REPORTS

MADE TO THE

GENERAL ASSEMBLY OF ILLINOIS,

AT ITS

TWENTY-SIXTH SESSION,

CONVENED

JANUARY 4, 18[illegible]

TRANSFERRED
JAN 7 1911

VOLUME III.

SPRINGFIELD:
ILLINOIS JOURNAL PRINTING OFFICE.
1869.

Cornell
N.Y. Public Lib
2-2-28

TABLE OF CONTENTS.

I. REPORT OF THE BOARD OF TRUSTEES OF INDUSTRIAL UNIVERSITY, for year ending June 5, 1869.

II. PROCEEDINGS OF CONVENTION OF CATTLE COMMISSIONERS, held in Springfield, December 1st, 2d and 3d, 1868.

III. REPORT OF THE INVESTIGATING COMMITTEE on the Hospital for the Insane, and other State Institutions.

SECOND ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

FOR THE ACADEMIC YEAR

COMMENCING SEPT. 14, 1868, AND ENDING JUNE 5, 1869.

WITH A REPORT OF THE

AGRICULTURAL LECTURES AND DISCUSSIONS

HELD AT THE UNIVERSITY

JANUARY 12TH TO 22D, 1869.

SPRINGFIELD:
STATE JOURNAL PRINTING OFFICE.
1869.

Every man is a consumer, and ought to be a producer. He fails to make his place good in the world, unless he not only pays his debt, but also adds something to the public wealth. Nor can he do justice to his genius without making some larger demand on the world than a bare subsistence. He is by constitution expensive, and needs to be rich.

Wealth has its source in applications of the mind to nature, from the rudest strokes of spade and ax, up to the last secrets of art. Intimate ties subsist between thought and all production, because a better order is equivalent to vast amounts of brute labor. The forces and resistances are Nature's, but the mind acts in bringing things from where they abound to where they are wanted; in wise combining; in directing the practice of the useful arts, and in the creation of finer values, by fine art, by eloquence, by song, or the reproductions of memory.—*Ralph Waldo Emerson.*

CONTENTS.

PAGE.

CIRCULAR AND CATALOGUE 1

PROCEEDINGS BOARD OF TRUSTEES:

November Meeting, 1868 36

March Meeting, 1869 60

MINUTES OF MEETINGS OF EXECUTIVE COMMITTEE, from April, 1868, to June, 1869 101

AGRICULTURAL LECTURES AND DISCUSSIONS 120

Address of Welcome and Agricultural Facts and Theories, by J. M. Gregory, Regent 122

Fruit Culture, by J. A. Warder 129

Relation of Chemistry to Agriculture, by Prof. A. P. S. Stuart 142

Meteorology, by Prof. W. M. Baker 154

Soils of Illinois, by H. C. Freeman 165

Management of Soils, by J. A. Warder 166

Grass, by L. D. Morse 173

Corn, by M. L. Dunlap 188

The Plant, by J. A. Warder 200

Wheat, by W. C. Flagg 208

Potatoes, by J. Periam 218

Root Crops, by J. Periam 228

Agricultural Book-Keeping, by Assistant Prof. Ed. Snyder 235

Orchard Fruits, by Dr. E. S. Hull 241

Grapes, by George Husmann 257

Propagation, by J. A. Warder 264

Small Fruits, by Samuel Edwards 268

Cattle 278

The Horse, by N. J. Colman 283

The Grape Vine, by J. A. Warder 289

Swine, by E. Baldwin 292

Sheep, by A. M. Garland 303

Agricultural Botany, by Assistant Prof. T. J. Burrill 319

AGRICULTURAL LECTURES AND DISCUSSIONS: PAGE.
Propagation by Cuttings, by J. A. Warder 330
Anatomy, Physiology and Economy of Plants, by John H. Tice 331
Timber Growing, by O. B. Galusha 352
Appendix 368
Index 371

OFFICERS AND COMMITTEES OF BOARD OF TRUSTEES.

President—JOHN M. GREGORY, LL.D.
Treasurer—JOHN W. BUNN, Springfield.
Corresponding Secretary—WILLARD C. FLAGG.
Recording Secretary—PROF. WILLARD L. BLISS.
Executive Committee—REGENT, COBB, BROWN of Pulaski, PICKRELL, CUNNINGHAM, GRIGGS, GOLTRA, PULLEN, and WRIGHT.
Agricultural Committee—PICKRELL, JOHNSON, ALLEN, KILE, and BLACKBURN.
Horticultural Committee—A. M. BROWN, PULLEN, GALUSHA, PEARSON, and EDWARDS.
Finance Committee—COBB, BURCHARD, A. M. BROWN, PICKRELL, and GRIGGS.
Building and Grounds Committee—GOLTRA, VAN OSDEL, GRIGGS, CUNNINGHAM, JOHNSON, REGENT.
Auditing Committee—LAWRENCE, DUNLAP, CUNNINGHAM, PEARSON, and GALUSHA.
By-Laws Committee—BURCHARD, LAWRENCE, SLADE, REGENT.
Faculty and Course of Study—REGENT, EDWARDS, GRIGGS, HAYS, BATEMAN, and BLACKBURN.
Military Affairs—BRAYMAN, DUNLAP, SCROGGS, KITCHELL, and KILE.
Library and Cabinet—REGENT, BATEMAN, MAHAN, ALLEN, MCMURRAY, and SLADE.
Mechanical Department—VAN OSDEL, BROWN of Chicago, DUNLAP, and GRIGGS.

CIRCULAR AND CATALOGUE

OF THE

OFFICERS AND STUDENTS

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

URBANA, CHAMPAIGN COUNTY,

Post Office.....CHAMPAIGN.

ILLINOIS INDUSTRIAL UNIVERSITY.

THE ILLINOIS INDUSTRIAL UNIVERSITY is located between the contiguous cities of Urbana and Champaign, Champaign County, Illinois, 128 miles from Chicago, on the Chicago branch of the Illinois Central Railroad.

It was first opened for the reception of students on Monday, the 2d day of March, 1868.

The Industrial University was founded by an act of the Legislature, approved February 28, 1867, and endowed by the Congressional grant of *four hundred and eighty thousand* acres of land scrip, under the law providing for Agricultural Colleges. It was further enriched by the donation of Champaign county, of farms, buildings, and bonds, valued at $400,000.

The main University building is of brick, one hundred and twenty-five feet in length, and five stories in height. Its public rooms are sufficient for the accommodation of over four hundred students, and it has private study and sleeping rooms for one hundred and twenty. The cities of Champaign and Urbana, which are connected by a street railroad running past the University grounds, are well supplied with churches and schools, and afford abundant facilities for boarding and rooming a large body of students.

The University domain, including ornamental and parade grounds, experimental and model farms, gardens, etc., comprises over one thousand acres of land.

AIMS OF THE UNIVERSITY.

The chief aim of the Industrial University, as expressed in the law of Congress, is "THE LIBERAL AND PRACTICAL EDUCATION OF THE INDUSTRIAL CLASSES in the several pursuits and professions in life." In order to do this, it is required, under the Statute of Incorporation, "*to teach, in the most thorough manner, such branches of*

learning as are related to Agriculture and the Mechanic Arts, and Military Tactics, without excluding other scientific and classical studies." The hope of the Trustees and Faculty is that the Institution will produce scholars of sound learning, but also of practical sense and skill—men abreast with their times—men of Christian culture, trained to affairs, and able and willing to lend a helping hand in all the great practical enterprises of this most practical age; fitted to be leaders, if need be, in those mighty industrial interests on which the social well-being and civilization of our country so much depend. It is also their aim and hope that the University shall contribute to the increase and diffusion of real science, and especially of that science which bears upon and promotes the useful arts.

DEPARTMENTS OF STUDY.

The following new and enlarged statement of the Departments of Study and Instruction, has been prepared to prevent the injurious misapprehensions which are stated to have grown, in some instances, out of former enumerations of studies. Classes are already at work in most of these Departments and will be organized in the others when the wants of students shall require it.

Special prominence is given to those "branches of learning related to Agriculture and the Mechanic Arts," but entire liberty is allowed to each student to select such studies as he may be prepared to pursue. The University is designed more especially for young men who have already attained such age that they may properly claim to be the judges of their own wants. It is not thought useful or right to attempt to urge every student, without regard to his capacity, or tastes, or practical wants, through some stiff and stilted "course of studies." While opportunities are freely provided for a thorough and full mastery of each branch of useful learning, the student is exhorted to study carefully his own capacity and needs; to choose, with serious and independent consideration, the branches which will best fit him for his chosen work, and to pursue them to such extent as he may be able.

It is expected that each student will pursue studies in three or more departments at the same time, in order to fully employ his time. But, on special request, he may give his whole time to any one department, if the studies and practice in that department will afford him full employment.

In the appendix will be given several combined courses of studies, to aid the student to select such a course as may best fit him for his chosen profession or pursuit in life. These courses are given simply as hints to guide the inexperienced, and must by no means be understood as restricting the entire liberty of choice which is a fundamental idea of the University.

DEPARTMENT OF CHEMISTRY.

The course in this department will occupy four years, and is designed to make students at home in the applications of chemistry to agriculture, and the arts and manufactures; in a word to make them thorough chemists.

FIRST YEAR.—*First Term.*—Inorganic Chemistry. *Second Term.*—Organic Chemistry. *Third Term.*—Qualitative Analysis—detection of the alkalies the alkaline earths, the earths, the metals, the mineral acids, and the organic acids. Use of the blow pipe and the spectroscope. Descriptive Mineralogy. Instructions on the subject will be given by lectures, and the students will have practice in determining minerals.

SECOND YEAR.—*First Term.*—Qualitative Analysis—a series of substances for practice in the detection and separation of the elements. Practice in Mineralogy continued. *Second Term.*—Quantitative Analysis—salts, minerals, ores, alloys, furnace products, etc. Practice in Mineralogy continued. *Third Term.*—Quantitative Analysis, of soils, manures, ashes of plants, mineral waters, etc. Practice in Mineralogy continued.

THIRD YEAR.—*First Term.*—Quantitative Analysis continued. Assaying. Volumetric Analysis. *Second Term.*—Organic Analysis. Detection and separation of organic acids and bases, and other organic compounds. *Third Term.*—Quantitative Organic Analysis: 1st, of compounds containing carbon and hydrogen; 2d, of compounds containing carbon, hydrogen and oxygen; 3d, estimation of nitrogen, sulphur, chlorine, bromine and iodine in organic compounds.

FOURTH YEAR.—*First Term.*—Preparations of Chemicals. *Second Term.*—Chemistry applied to the arts of dying, bleaching, calico printing, electrotyping and photographing. *Third Term.*—Lectures on the manufacture of glass and procelain, the smelting of ores. Heating and illumination.

DEPARTMENT OF NATURAL HISTORY.

The course in this department extends through four years.

FIRST YEAR.—*First Term.*—Structural and Physiological Botany. Form, arrangement, structure, morphology, growth and office of the leaves and flowers; forms, growth and office of stem and root; cellular tissue, cell development, cell contents and cell transformations. Structure, parts and uses of seeds and fruit; and the food, nutrition and reproduction of plants. The whole illustrated by living and dried specimens and drawings. Also, enough of Systematic Botany to enable the general student to analyze the flowering plants. *Second Term.*—Systematic Botany in lectures: 1st, the natural orders, their extent, properties, uses and distribution; 2d, use of the microscope.

Vegetable Physiology continued. Chemistry of plants and of their food. Fungi and vegetable diseases, and outlines of the classes. Distribution and reproduction of the Cryptogamia. Two lectures a week. *Third Term.*—Systematic Botany. Practical collection and examination of the flowering and flowerless plants from all parts of the State as far as practicable. Botanical excursions and surveys.

SECOND YEAR.—*First Term.*—Principles of Zoology—development, structure, classification and distribution of animals. *Second Term.*—Systematic Zoology in lectures: 1st, natural orders, families, etc.; 2d, Embryology and and peculiar modes of reproduction; alternate generation; Comparative Anatomy as applied to clasification. Collection and preservation of specimens, and Natural History of domestic animals. *Third Term.*—Entomology; clasification of insects; habits of those injurious to vegetation, with means of checking their ravages. Habits of beneficial species.

THIRD YEAR.—*First Term.*—Zoology—General Physiology. Comparative Anatomy and Veterinary Surgery. *Second Term.*—Principles of Geology. *Third Term.*—Lithological Geology—sources and materials of mineral wealth; building stones; mineral veins. Palæontology.

FOURTH YEAR.—*First Term.*—Historical and Dynamical Geology. Palæontology. *Second Term.*—Physical Geography and Meteorology, *Third Term.*—Special Geology of Illinois—Method of conducting surveys. Practical excursions.

DEPARTMENT OF AGRICULTURE.

This department will ultimately be divided into two:

1. The Department in General Agriculture.
2. The Department in Horticulture, Fruit Growing, Landscape Gardening.

The aim of the courses will be to fit students to manage successfully, for themselves or others, agricultural and horticultural estates and enterprises. The studies will be pursued partly by lectures, accompanied by courses of reading and examinations, and partly by the regular study of text books. Practical exercises and experiments on the farm, and in the gardens, nurseries, and fruit plantations, will constitute a part of the course.

It is designed to arrange, from the studies connected with agriculture, several distinct courses, one to occupy two years, one three years, and the third four years. Students may take either, at their option, or may select studies from either, but a student having made his selection, is not expected to change during the term.

The following presents the full course of studies in this department:

FIRST YEAR.—*The Farm.*—Its measurements and mapping; sub-divisions—meadows, pastures, orchards, woodlands, gardens, etc. Fences, hedges, farm buildings. Soils—classification and mechanical treatment of soils, plowing, etc. Drainage. Plant culture—Structure and Physiology of plants; classes of the useful plants, their characteristics, varieties, habits and values. Wheat culture, maize culture, grass culture, root culture, fruit culture begun, apples, pears, peaches, etc.

Related Studies.—Structural Botany. Inorganic Chemistry. Vegetable Physiology. English Language.

SECOND YEAR.—*The Farm.*—Chemical elements and chemical treatment of soils. Fertalizers—their composition, manufacture, preservation and application. Climate, influence of light, heat, and electricity on soils and vegetable growth. Farm Implements—principles of structure and use. Road making. Fruit culture—modes of propagation, production of new varieties, diseases of fruit trees. Insects injurious to vegetation. Animal husbandry—breeds and varieties of neat cattle, horses, sheep, and swine. Principles of breeding, rearing, training, fattening, etc. Chemical composition of food, and preparation of the several varieties. Sheep husbandry. Poultry. Bees.

Related Studies.—Trigonometry, Chain Surveying and Mensuration. Geometrical Drawing. Topographical Drawing. Vegetable Economy. Chemistry. German.

THIRD YEAR.—*Agricultural Economy.*—Relation of agriculture to the other industries and to commerce. The several branches of agriculture. Agricultural book keeping, the farm book, herd book, etc.

Related Studies.—General principles of Geology. Local and agricultural Geology. Theoretical Agriculture. Compass Surveying and Leveling. Maps of farm surveys. French.

FOURTH YEAR.—*Rural Law.*—Of tenures and conveyances of land, of highways, of cattle, of fences, of noxious weeds, etc. Veterinary surgery and medicine. Landscape gardening, and laying out of large farming estates. Rural architecture and engineering. Foreign agriculture. History and literature of agriculture.

Related Studies.—English Literature. Inductive Logic. Animal Physiology. Entomology. Meteorology. Physical Geography. Political Economy.

DEPARTMENT OF PURE MATHEMATICS.

The studies of this department extend through three years. Those of the first year belong properly to the preparatory course, and should, when practicable, be completed before entering, by those who wish to take either of the fuller courses in the University.

FIRST YEAR.—(Preparatory.)—*First Term.*—Geometry, first four books of Legendre. *Second Term.*—Geomerty completed through eighth book. *Third Term.*—Algebra. Davies' Bourdon—Chapters VII-IX.

SECOND YEAR.—*First Term.*—Trigonometry. Special Geometry. *Second Term.*—Trigonometry one-third term. Analytical Geometry two-thirds term. *Third Term.*—Analytical Geometry completed.

THIRD YEAR.—*First Term.*—Higher Algebra. *Second Term.*—Differential Calculus. *Third Term.*—Integral Calculus.

DEPARTMENT OF NATURAL AND MECHANICAL PHILOSOPHY AND ASTRONOMY.

The course in this department will occupy four years, and will be pursued with the use of text books, combined with lectures, and practical investigations of the several subjects.

FIRST YEAR.—*First Term.*—Natural Philosophy—Properties of Matter, Force, Gravity, Falling Bodies, Pendulum, Motion, Projectiles, Hydrostatics

and Hydraulics, etc. Mechanical Drawing. *Second Term.*—Natural Philosophy—Pneumatics, Barometer, Pumps, Steam Engine, Acoustics, Optics, Electricity, etc. Mechanical Drawing. *Third Term.*—Mechanics. Drawing.

SECOND YEAR.—*First Term.*—Heat—Steam and its applications, Steam Engine, its theory, construction, history, etc. Air Engines, and drafts of Engines. *Second Term.*—Electricity, statical, dynamical, Terrestial Magnetism, Construction and use of Telegraph, Theory of Electroplating, etc., Acoustics, Laws of Sound. *Third Term.*—Optics, Theories of Light, Polarization, Telescopes, Microscopes, Mathematics of, etc.

THIRD YEAR.—*First Term.*—Practical Hydraulics—flow of liquids in pipes, pressure, etc. Hydrostatics, Motors, Practical Pneumatics, Friction, etc. *Second Term.*—Machinery—theory, construction, location, calculation of power, motors. *Third Term.*—Building materials, strength of materials, designs and estimates for mills, machinery, etc.

FOURTH YEAR.—*First Term.*—Astronomy—Solar System, Descriptive Astronomy. *Second Term.*—Stellar System, Meteorology, etc. *Third Term.*—Practical Astronomy, calculations of eclipses, use of instruments.

DEPARTMENT OF CIVIL ENGINEERING.

The studies in this department will occupy three years, and the instructions will be as follows:

FIRST YEAR.—*First Term.*—Chain Surveying, Mensuration, Geometrical Drawing. *Second Term.*—Descriptive Geometry, Geometrical Drawing. *Third Term.*—Compass and Transit Land Surveying, Leveling Plats, Maps of Farm Surveys.

SECOND YEAR.—*First Term.*—Topographical Surveying, Elements of Hydrographical Surveying, Leveling, Maps of Topographical Surveys. *Second Term.*—Mahan's Civil Engineering, Plans and Elevations of Engineering Constructions. *Third Term.*—Gillespie's Roads and Railroads. Railroad and Canal Surveying, Plans, Profiles and Sections of Surveys.

THIRD YEAR.—*First Term.*—Descriptive Geometry applied to Stone Cutting, Projections of the Earth, Warped Surfaces. Mathematical Theory, and results of Experiments upon the Strength of Materials, and of the Stability of Girder, Suspension, Tubular and Arch Bridges, and of Retaining Walls and Frames. Plans and Elevations of Engineering Constructions. *Second Term.*—Supply and Distribution of Water, Distribution of Gas, Drainage. Theory of Machines, Plans and Elevations of Engineering, Constructions. Machine Drawing. *Third Term.*—Method of determining the form of the Earth. Methods of the United States Coast Survey. Designs and Reviews of Special Machines, and Engineering Constructions. Discussion of Scientific Subjects. General Field Work.

The first year of the above course corresponds with the second year of the Mathematical course.

DEPARTMENT OF ENGLISH LANGUAGE AND LITERATURE.

The studies of this department will extend through three years. The instruction will be given by text books and lectures, with exercises in Compo-

dition, Essays, Forensics, Presentation and criticism of plans. Declamations throughout the course.

FIRST YEAR.—*First Term.*—Advanced Grammar, and the grammatical analysis of authors, etc. *Second Term.*—Principles of Punctuation, use of Capitals, etc., English composition. *Third Term.*—Grammatical and philological analysis of Milton and other authors, with history of their times and contemporaries.

SECOND YEAR.—*First Term.*—Grammatical and philological analysis of Shakespeare and earlier Dramatists, History of the times and contemporaries of Shakespeare. *Second Term.*—Grammatical and philological analysis of Chaucer and Spencer, and history of their times, etc. *Third Term.*—History of English Literature.

THIRD YEAR.—*First Term.*—History of English and American Literature of the 19th century. *Second Term.*—Rhetoric—Invention—Plans for Essays, etc. *Third Term.*—Elements of Criticism—Methods of Philological study, etc.

DEPARTMENT OF THE FRENCH LANGUAGE AND LITERATURE.

The course of instruction in French will extend through three years, but students who desire to pursue the language only far enough to enable them to read the scientific works which they may find it necessary to consult, are expected to acquire sufficient for this in a single year. The reading room will be supplied with French agricultural and scientific journals, which will be used in instruction as soon as the advancement of the student allows.

FIRST YEAR.—Robertson's Grammar, Fasquelle's Colloquial French Reader, McGill's French Reader.

SECOND YEAR.—Telemaque, Charles XII, and modern French authors, Arnoult's French Grammar.

THIRD YEAR.—Classic and modern French authors, De Vere's Advanced French Grammar for reference, History of French Literature.

DEPARTMENT OF GERMAN LANGUAGE AND LITERATURE.

The course in German will extend through three years. The first year is expected to prepare students to read such German scientific books as they may need or desire to consult. The second year's instruction will be so conducted as to enable students to complete their mastery of the language and give German students an opportunity to acquire a perfect knowledge of their native tongue.

FIRST YEAR.—German Grammar and Reader, German Classic Reader. One exercise a week in reading German agricultural and scientific papers.

SECOND YEAR.—Classic Reader, Schiller's William Tell, Goethe's Iphigenia. Conversation and Composition.

THIRD YEAR.—History of German Language and Literature, by Vilmar. Kohlrauchs Geschichte des deutschen Volkes. Conversation and Composition. Reading of scientific journals in the several branches.

DEPARTMENT OF THE LATIN LANGUAGE AND LITERATURE.

The course of instruction in this department will extend through three years, and will, at every stage, include a careful attention to the subject matter of the authors read in connection with the study of the language. A preliminary year is also provided in order to meet the present wants of students. This year is not considered a part of the regular course, and is to be dropped as early as practicable. Students will not be admitted to this department who are not prepared to enter at once upon the reading of Cæsar. For this purpose, a satisfactory knowledge of the Latin Grammar and Reader is required.

[PRELIMINARY YEAR.—Four books of Cæsar's Gallic war; Sallust's Conspiracy of Catiline; Ancient Geography of Europe, and chapters 64, 65 and 66 of Liddell's Rome.]

FIRST YEAR.—*First Term.*—Three orations of Cicero against Catiline Latin Prose Composition begun and continued through the course. Chapter. 67 to 71 inclusive of Liddell's Rome. *Second Term.*—Fourth oration against Catiline. Oration pro lege Manilia, and pro Archia Poeta. Political constitution of Rome. *Third Term.*—Selections from Virgil. Latin Prosody.

SECOND YEAR.—*First Term.*—Selections from Livy. Chapters 28–35 and 46 of Liddell's Rome. *Second Term.*—Livy continued. Horace begun. Chapters 38–45 Liddell's Rome. *Third Term.*—Selections from Horace and Juvenal, Geography of the Countries bordering on the Mediterranean.

THIRD YEAR.—*First Term.*—Cicero De Officiis. Lectures on the History of Roman Literature and Philosophy. *Second Term.*– Cicero De Oratore. Lectures on the origin and structure of the Latin language. *Third Term.*—Freize's Quintillian. Lectures continued. Other authors will occasionally be substituted in place of some of the above.

DEPARTMENT OF GREEK LANGUAGE AND LITERATURE.

This course will also occupy three years, and the instruction will resemble that in the Department of Latin.

FIRST YEAR.—Harkness' First Greek book. First three books of Xenophon's Anabasis Greek Prose begun.

SECOND YEAR.—Herodotus, Demosthenes, Thucydides, Homer's Iliad.

THIRD YEAR.—Xenophon's Memorabilia of Socrates. Selections from Plato and the Greek Poets.

Select portions of Smith's History of Greece will be read in course, and lectures given on the Grecian History, Literature and Philosophy.

DEPARTMENT OF HISTORY AND SOCIAL SCIENCE.

The study of this department will extend through three years. The instruction will be given partly with text books, but chiefly by lectures with

systematic readings of specified authors and daily examinations on the same. The study of historical geography will keep even pace with the history studied, and the chronology will be rendered as clear and distinct as possible. Written exercises on chronology, and essays in historical criticism will constitute prominent features of the course.

FIRST YEAR.—*First Term.*—Discovery, settlement and colonial history of United States, with notice of other American States. American geography Two lectures (or lessons) a week. *Second Term.*—History of the United States from the time of the Revolution. Two lectures (or lessons) a week. *Third Term.*—Political Economy. Five lessons a week.

SECOND YEAR—*First Term.*—Ancient history of Greece and Rome with notices of other ancient nations. Ancient Geography. Five lessons (or lectures) a week. *Second Term.*—Medeisæval history, with history of christianity and ancient schools of philosophy Scholasticism. Five lessons (or lectures) a week. *Third Term.*—Modern history—general European history. European geography. Five lessons (or lectures) a week.

THIRD YEAR. *First Term.*—Constitutional history of England, and of the United States. Two lectures a week. *Second Term.*—History of civilization Analysis of historical forces and phenomena. Notices of the history of the arts and inductive sciences. *Third Term.*—Political philosophy. Constitutional and international law.

COMMERCIAL DEPARTMENT.

The course in this department will occupy one or two years, according to the time the student may give to the special studies of the department.

First Term.—Book-keeping by single and double entry for sole trader—applied to farming, mechanic and mercantile accounts. Theory of the several principal and auxiliary books. Theory of journalizing. Penmanship. Commercial calculation.

Second Term.—Partnership business. Commission and shipping accounts. Railroad books. Manufacturing accounts. Farm books. Herd and stock books. Business forms and papers. Notes. Endorsements. Drafts. Bills of exchange, inland and foreign. Bills of lading. Accounts current. Accounts sales. Inventories, invoices, receipts, etc. Commercial correspondence.

Third Term.—Banking and insurance. Commercial customs. Commercial law. Currency and exchange. Political economy applied to trade, markets, etc. Commercial geography. History of commerce.

DEPARTMENT OF MILITARY TACTICS AND ENGINEERING.

FIRST YEAR.—*First Term.*—Infantry Tactics—Schools of the Soldier and Company; Squad and Company Drills. Reports and Returns required from Company Commandants. *Second Term.*—Infantry Tactics—School of the Battalion. Instruction for Skirmishers. Reports and Returns required from Battalion Commandants. Bayonet Fencing. *Third Term.*—Infantry Tactics—Evolutions of a Brigade. Reports and Returns required from Brigade

Commandants. Skirmish and Battalion Drills. Guard-mountings, Inspections, Escorts, Funeral Honors.

SECOND YEAR.—*First Term.*—Artillery Tactics in the different Schools. Artillery Drills. Reports and Returns required from Artillery Officers. *Second Term.*—Cavalry Tactics in the different Schools. Reports and Returns required from Cavalry Officers. Sword Fencing. *Third Term.*—Evolutions of a Division, and of a Corps, in the different Armies. Reports and Returns required from Division and Corps Commandants. Forms for Parade and Review of a Division and of a Corps. The Essential Principles of Strategy and Grand Tactics. Advanced Guard, Outpost and Detachment Service of Troops. History of the most remarkable Epochs in the Military Art. Infantry and Artillery Drills.

THIRD YEAR.—*First Term.*—Field Fortifications. Descriptive Geometry applied to Drawing Fortifications. Duties of Staff Officers. Plans, Profiles and Sections of proposed Works. *Second Term.*—Permanent Fortifications. Theory of Gunnery, and Results of Experiments. Plans, Profiles, Sections and Drawings of proposed Works. *Third Term.*—Jomine's Art of War. Duane's or Mahan's Manual for Engineer Troops, consisting of Pontoon Drill, Practical Operations of a Seige, School of the Sap, Military Mining, Construction of Batteries. Cullom on Military Bridges. Benet's Military Law. Army Regulations.

The three years, or any two, may be taken in one, if the student is properly prepared in other studies.

DEPARTMENT OF MENTAL AND MORAL SCIENCE.

The studies in this department will occupy one year. The instruction will be given by lectures, combined with reading selected portions from specified authors, and examinations on the topics discussed.

First Term.—Mental philosophy—definitions and classification of mental phenomina. Connections and relations of mind and matter. Theories of perception. Phenomena of consciousness. Doctrines of ideas. Theory of mental culture. Three lectures a week.

Science of education, or mental philosophy applied to education. Two lectures a week.

Second Term.—Moral philosophy—connection of moral and mental philosophy. Theories of moral obligation. The moral powers. Practical ethics. Three lectures a week. Logic. Two lectures a week.

Third Term.—History of philosophy. Modern schools of philosophy. Inductive logic. Three lectures a week.

LECTURE COURSES.

It is a part of the plan of the University to provide courses of lectures in special departments of knowledge and art. These lectures will be given by regular members of the Faculty, or by eminent scholars and authors whose services may be secured for this purpose. Dr. John A. Warder, the eminent

American pomologist, has already accepted an appointment, and will deliver, during the winter term, a course of lectures on fruit growing, etc. Rev. Edward Eggleston, an eminent writer and editor, is also under appointment as lecturer on English Literature, and negotiations are in progress to secure other lecturers.

A weekly lecture is delivered to all the students, on manners, formation of habits and character; on the conditions of health, happiness, and success in life; on the general duties and affairs of life; on methods of study, courses of reading, etc.

AGRICULTURAL LECTURE SESSION.

It is also designed to hold at the University, each winter, a lecture session of two weeks, for several courses of lectures on the several branches of Agricultural and Horticultural science, to be delivered by gentlemen of eminent acquirements and experience in these departments. Due notice of the time of this course will be given. It is hoped and expected that these lectures will bring together a large number of the practical farmers and fruit growers of this and adjoining States, and that discussions of great value will follow the several lectures. Arrangements will be made to provide board at reasonable rates, and comfortable quarters, for as many as may attend.

APPARATUS OF INSTRUCTION.

A costly set of philosophical and chemical apparatus has just been received from the celebrated manufactory of E. S. Richie & Son, Boston, and large additions will be made at an early day. Rooms are set apart for a good working laboratory for the students in analytical chemistry, which will be fitted up under the direction of the Professor in Chemistry.

Valuable collections have already been secured for cabinets, in Mineralogy, Botany, Conchology, Geology, Palæontology, and in several departments in Zoology; and Prof. Powell, of the Chair of Natural History, is now absent in charge of a scientific expedition to the region of the Colorado of the North, making additional collections.

The illustrative apparatus in the Departments of Agriculture is designed to be very full and complete. The University owns over one thousand acres of improved farming lands, equal to any in the State. Forty acres are set apart for gardens, nurseries, and specimen orchards. The remainder are to be used for experimental and stock farms, orchards, arboretum, etc, Through liberality of manufacturers, the University is rapidly accumulating a collection of agricultural implements; and cabinets and drawings of specimen fruits, vegetables, etc., will be added as fast as practicable. The ornamental grounds around the building already contain a large variety of evergreens and flowering plants.

A collection of maps, charts, models and engravings, is also begun, and is being steadily increased by donation or purchase.

THE UNIVERSITY UNIFORM.

Under the authority of the act of incorporation, the Trustees have prescribed that all the students shall wear the University uniform. This uniform consists of a suit of cadet-gray mixed cloth, of the same color and quality as that worn at West Point, and manufactured by the same establishment.

The coat is a single-breasted frock, buttoned to chin, with standing collar, and a trimming of black mohair cord on shoulders, in loops. The vest is also single-breasted, buttoned to chin, with standing collar. Buttons for coat and vest are manufactured purposely for the University. They are gilt, of medalion style, the design being a sheaf of wheat surrounded with the words, "Illinois Industrial University." The pants have a welt of dark blue in the outside seams. The suit is a very tasteful dress, and is substantial and enduring. An arrangement has been made with responsible parties to furnish the suits to students at twenty-seven dollars each. Students can procure them ready made on their arrival here.

The University cap is of dark blue cloth, and ornamented with the initials I. I. U., surrounded by a silver wreath in front.

The arms and equipments used in the drill are furnished by the State.

Students will wear their uniform always on parade, but in their rooms, and at recitation, may wear other clothing. An army blouse, or fatigue dress, will be furnished at low rate to those that want it.

CHOICE OF STUDIES.

Entire liberty of choice is allowed each student, in selecting the departments which he will enter and the studies he will pursue. It is expected that students will ordinarily pursue the studies of two or more departments at the same time. Each student is required to have fifteen lessons a week, unless specially excused for cause. Changes from one department to another can only be made at the opening of a term.

REQUIREMENTS FOR ADMISSION.

1. Each student is required by law to be at least *fifteen years* of age, but it is believed that few will be found mature enough at this age to enter with the highest profit upon the studies of the University, and it is recommended as a general rule, that students be at least eighteen years old before entering.

2. The law also prescribes that "no student shall be admitted to instruction in any of the departments of the University, who shall not previously undergo a satisfactory examination in each of the branches ordinarily taught in the common schools of the State." In addition to these, candidates for any particular department will be examined in such studies as may be necessary to fit them to pursue successfully the course in that department.

The chief aim of all examinations for admission to the University is to ascertain the student's preparation to pursue successfully the studies of the course. Hence, thoroughness, and a general knowledge of the subject, will be accounted as of more importance than the amount studied. A student of

earnest purpose and well disciplined mind will often pursue a new study more successfully than one of much more extensive preparation, but of less discipline and diligence. Much more solicitude is felt about the progress of the student after he enters, than about the preparation made before he enters, the University. Frequent and searching examinations will be held to test the progress in study, and to determine each student's fitness to remain in the classes. The University cannot be held responsible for the lack of thoroughness in the common school studies of its students, but will insist upon thoroughness in its own proper studies.

THE LABOR SYSTEM.

Practice in some form, and to some extent, is indispensable to a practical education. It is the divorcement of the theoretical and practical which renders so much of education mere "book learning." To guard against this fatal defect, the trustees have directed that the manual labor system shall be thoroughly tried, and all students, who are not excused on account of physical inability, are required to labor from *one* to *two* hours each day, except Saturday and Sunday. During the autumn the labor occupied only one hour a day. The students go out in squads, under their military officers, and under the general supervision of members of the faculty, or superintendents of the departments.

The labor is designed to be educational, and to exhibit the practical applications of the theories taught by the text books and in the lecture room. Thus far it has been popular among the students, several attributing to it the preservation of their health through a long term of severe study. They have already accomplished a large amount of valuable work, and are proud to point to the grounds fenced, planted with trees, and ornamented by their own labor. It is found to facilitate, rather than hinder study, and affords a much more valuable means of physical culture than any system of gymnastics.

The labor is compensated in proportion to the ability and fidelity of each laborer, the maximum compensation being eight cents an hour. Many students voluntarily work over hours, and receive for such overwork twelve and a half cents an hour. The experience of the past confirms the belief that this union and alternation of mental and muscular effort will not only give the "sound mind in a sound body," but will help to produce educated men who will be strong, practical and self-reliant, full of resource, and practical in judgment, the physical equals of the strongest, and the mental peers of the wisest; thus redeeming higher education from the odium of puny forms and pallid faces, and restoring the long lost and much needed sympathy between educated men and the great industrial and business classes.

It is not expected that all prejudices against work will disappear at once, or that labor will at once assume for all, its position of native dignity and honor; but we may confidently hope, if the increasing numbers do not render it impracticable to furnish profitable employment, finally to overcome the strongest prejudices, and render the labor system one of the most popular features of the University, with the public as well as with the students themselves.

HONORARY SCHOLARSHIPS.

The Legislature prescribed that one honorary scholar shall be admitte from each county in the State. These scholarships, which are designed "fo the benefit of the descendants of soldiers and seamen who served in th armies and navies of the United States during the late rebellion," entitle th incumbents to free tuition. The trustees have also authorized the faculty o the University to remit the tuition of worthy young men whose circum stances are such as to require this aid.

PRIZE SCHOLARSHIPS.

A movement has been started to secure in each county of the State the endowment of a prize scholarship, with a permanent fund of $1,000 for each. The plan contemplates that the income of this fund shall be annually awarded to the best scholar from the public schools of the county, who shall present himself as a candidate for the University. The scholarship shall be determined by a competitive examination, to be held in each county, under the Regent of the University, and the State Superintendent of Public Instruction. The examinations will be held the first Friday in September, or at such time and place as the county superintendent of schools may appoint. Honorary scholars will be examined at the same time. Only a few of the counties have as yet provided for the prize scholarship, but it is hoped that a prize of greater or less amount will be provided in each county in which a worthy candidate shall be selected.

STUDENTS' DORMITORIES AND BOARD.

There are in the University building about sixty private rooms for students, which are rented to the students who first apply. Each room is designed for the accommodation of two students. These rooms are fourteen feet long and ten feet wide. They are without furniture, it being deemed best that students shall furnish their own rooms. It is earnestly recommended for health's sake that each student have a separate bed. A narrow bedstead and mattress, with suitable clothing, shall be provided by each. A study table, chairs, and a small coal stove, may be provided in common by the occupants of the room.

Good private boarding houses are already springing up around the University, where either day board, or board and rooms can be obtained, with the advantages of the family circle. Several students have provided themselves with meals in their rooms, at an expense varying from $1 to $1 50 per week.

To avoid unnecessary litter about the grounds, coal is purchased by the University at wholesale, and furnished to students at cost.

HOW TO ENTER THE UNIVERSITY.

In answer to the questions often received, the following explicit directions are given to young men wishing to enter the University:

1st. If you are over fifteen years of age, of good habits, and have a fair

knowledge of the common school branches, Arithmetic, Grammar, Geography, and History of the United States, you may enter, and take any course of study you are prepared for. The further advanced in study, the better you will be prepared to secure the full advantages of a residence at the University.

Some of the Departments require more preparation than others.

2d. You should enter at the beginning of a term; but you may enter at any other time if prepared to go forward with any of the classes.

3d. If doubtful of your ability to enter the departments you have selected, write to the Regent, J. M. Gregory, Champaign, and state what branches you have studied, the progress you have made in each, and your wishes as to course and term of study.

4th. If prepared, come on at once, bringing with you, if practicable, a letter of recommendation from your last teacher, or county superintendent of schools, or any good citizen.

HOW CAN I PAY MY WAY?

In answer to this question which often reaches us from earnest young men, eager for an education, but without means, we reply:

1st. Your necessary expenses (except for books and clothing,) will be as stated on the next page, under the head of "Expenses."

2nd. During the Spring and Fall terms, and to some extent during the Winter term, you can find work on the University farm and gardens, or in the shops, for which you will be paid 12½ cents per hour, if diligent and faithful. You can easily, without hindering your studies, work three hours a day, and if needful the whole day, on Saturdays. This will amount to $3 12½ per week, and will, if you choose to board yourself, more than cover all your expenses. If you understand some common trade, you can do still better. You will easily be able to earn, during the vacation, enough to buy your clothes and books. Some students pay their way, and have money to spare.

If possible you should have, to start with, money enough to pay your entrance fee and bills, and to buy your half of the furniture of your room, which will cost, say $15. Your uniform will cost you $27; but this will save you from purchasing other clothing to start with. You will find numbers of fellow students, who are taking care of themselves, and who will, with true brotherly feeling, advise and assist you. Come on without fear. What man has done, man can do.

TERMS AND VACATIONS.

The college year is divided into three terms of twelve weeks each. The work of the term will in all cases commence on Monday morning, and students who fail to be present at the opening will be expected to make up, by private study, every lesson which may have been passed over by their classes. Examination of new students will be held the Saturday preceding the opening of the term.

The only vacations are, the holiday recess, including Christmas and New Years, a vacation of one week between the winter and spring term, and the long vacation at the close of the third term.

CALENDAR FOR 1869–'70.

Winter term closes	March 6th,	1869.
Spring " opens	March 15,	"
Spring " closes	June 5,	"
Fall " opens	Sept. 13,	"
Fall " closes	Dec, 4,	"
Winter " opens	Dec. 6,	"
Winter " closes	March 5,	1870.
Spring " opens	March 14,	"
Spring " closes	June 4.	"

EXPENSES.

Tuition to Illinois students	$15 00 per annum.
Tuition to foreign students	20 00 "
Fee for incidentals	2 50 per term.
Room rent for each student	4 00 "

Room rent is only charged to students who room in the University building. Each student is required to pay a matriculation fee of $10 on first entering the institution. This entitles him to membership till he completes his studies. Honorary and prize scholars pay no tuition fee, but pay all other fees. All bills due the University must be paid, and the treasurer's receipt be shown to the Regent, before the student can enter the classes. Students boarding in University Hall will be required to deposit with the steward $10 each, to apply on their board bills at the close of the term.

The annual expense of a residence at the University, exclusive of books and clothing, will be nearly as follows:

Tuition, room rent, and incidentals, from	$34 50 to	$39 50
Board in Hall	108 00 to	126 00
Fuel and lights	10 00 to	15 50
Washing, 75c. per dozen	10 00 to	15 00
Total	$168 00	$195 00

Many young men reduce the expense to within $100 a year, and pay this by their labor during the year. It ought to be known that *any young man can pay his way through college* who is willing, for the sake of an education, to practice steadily the virtues of industry and economy.

GOVERNMENT.

The University is designed for *men*, not *children*, and its government rests in an appeal to the manly feeling and sense of honor of its students. It has but one law, and that is, "DO RIGHT." If any student shall show himself so weak or corrupt that he can not, when thus treated, refrain from vicious conduct, he will receive permission to leave the institution, where his presence

can only injure others, without being of any benefit to himself. But no pains will be spared to counsel the inexperienced, to admonish the careless, and to save the tempted. Especially will it be an object to establish and maintain that high toned, refined, and honorable public sentiment, which is at once the best safeguard against meanness and vice, and a constant inspiration to nobleness and virtue.

DONATIONS.

In addition to the donations heretofore acknowledged, the officers of the University take pleasure in acknowledging the following:

Hon Lyman Trumbull, Hon. John A. Logan, Hon. S. M. Cullom, congressional documents and speeches.

J. Davis Wilder, Chicago, 8 yards paper black board.

Edgar Sanders, Florist, Chicago, several flower bulbs.

A. Blumenschein, Florist, Chicago, collection of green-house plants.

T. A. E. Holcomb, South Pass, Ill., collection of Roses and green-house plants.

E. M. Potter, Kalamazoo, Mich., Potter's Three-horse Clevis.

Collins Co., Hartford, Conn., per H. H. Taylor, agent, Chicago, 1 cast steel plow with steel beam.

J. H. Pickrell, Harristown, Ill., 1 large and beautiful colored lithograph of group of Durham cattle.

Harper Brothers, Publisher's, New York, set of classical text books and histories.

D. Appleton & Co., Publishers, New York, several text books.

Sheldon & Co., Publishers, New York, several text books.

A. S. Barnes & Co., Publishers, New York, 1 set Mathematical and other text books.

John Burchard, Beloit, Wis., Gates and Castings for self-opening gates.

BOARD OF TRUSTEES.

MEMBERS EX-OFFICIO.

HON. JOHN M. PALMER, *Governor.*
HON. NEWTON BATEMAN, LL. D., *Sup't of Public Instruction.*
Dr. WILLIAM KILE, *President State Agricultural Society.*
JOHN M. GREGORY, LL. D., *Regent of University.*

MEMBERS APPOINTED BY THE GOVERNOR AND SENATE.

Name.	District.	Post Office.	County.
Lemuel Allen	8th Congressional	Pekin	Tazewell
Alexander Blackburn	9th Congressional	Macomb	McDonough
Mason Brayman	2d Grand Judicial	Springfield	Sangamon
A. M. Brown	13th Congressional	Villa Ridge	Pulaski
Edwin Lee Brown	3d Grand Judicial	Chicago	Cook
Horatio C. Burchard	5th Congressional	Freeport	Stephenson
J. C. Burroughs	3d Grand Judicial	Chicago	Cook
Emery Cobb	3d Grand Judicial	Kankakee	Kankakee
J. O. Cunningham	2d Grand Judicial	Urbana	Champaign
M. L. Dunlap	7th Congressional	Champaign	Champaign
Samuel Edwards	5th Congressional	LaMoille	Bureau
O. B. Galusha	6th Congressional	Morris	Grundy
M. C. Goltra	10th Congressional	Jacksonville	Morgan
David S. Hammond	1st Congressional	Elgin	Kane
C. R. Griggs	2d Grand Judicial	Urbana	Champaign
S. S. Hayes	3d Grand Judicial	Chicago	Cook
John S. Johnson	4th Congressional	Warsaw	Hancock
Edward Ketchell	11th Congressional	Olney	Richland
Luther Lawrence	2d Congressional	Belvidere	Boone
Isaac W. Mahan	1st Grand Judicial	Centralia	Marion
L. B. McMurray	1st Grand Judicial	Effingham	Effingham
John M. Pearson	12th Congressional	Godfrey	Madison
J. H. Pickrell	2d Grand Judicial	Harristown	Macon
Burden Pullen	1st Grand Judicial	Centralia	Marion
Thomas Quick	1st Grand Judicial	Irvington	Washington
J. W Scroggs	2d Grand Judicial	Champaign	Champaign
Paul R. Wright	1st Grand Judicial	South Pass	Union
John M. VanOsdell	3d Grand Judicial	Chicago	Cook

OFFICERS AND INSTRUCTORS.

JOHN M. GREGORY, LL. D.,
REGENT, AND PROFESSOR OF PHILOSOPHY AND HISTORY.

WILLIAM M. BAKER, M. A.,
PROFESSOR OF ENGLISH LANGUAGE AND LITERATURE.

*GEORGE W. ATHERTON, M. A.,
PROFESSOR OF HISTORY AND SOCIAL SCIENCE, AND INSTRUCTOR IN LATIN.

J. W. POWELL, M. A.
PROFESSOR OF NATURAL HISTORY AND GEOLOGY.

WILLARD F. BLISS, M. A.,
PROFESSOR OF AGRICULTURE.

A. P. S. STUART, M. A.,
PROFESSOR OF THEORETICAL AND APPLIED CHEMISTRY.

———— ————

PROFESSOR OF HORTICULTURE.

———— ————

PROFESSOR OF MECHANICAL SCIENCE.

———— ————

PROFESSOR OF CIVIL AND RURAL ENGINEERING.

———— ————

PROFESSOR OF MATHEMATICS.

THOMAS J. BURRILL,
ASSISTANT PROFESSOR OF NATURAL HISTORY.

COL S. W. SHATTUCK, M. A.,
ASSISTANT PROFESSOR OF MATHEMATICS, AND INSTRUCTOR IN MILITARY TACTICS.

CAPT. EDWARD SNYDER,
ASSISTANT PROFESSOR OF BOOK KEEPING AND GERMAN.

JONATHAN PERIAM,
HEAD FARMER AND SUPERINTENDENT OF PRACTICAL AGRICULTURE.

NON-RESIDENT PROFESSORS.

JOHN A. WARDER, M. D., CINCINNATI,
LECTURER ON VEGETABLE PHYSIOLOGY AND FRUIT GROWING.

EDWARD EGGLESTON, M. A., CHICAGO,
LECTURER ON ENGLISH LITERATURE.

———— ————

LECTURER ON VETERINARY SCIENCE.

*Resigned Jan. 1, 1869.

CATALOGUE OF STUDENTS.

SPRING TERM OF 1869.

Names.	Residence.		Nativity.
	City.	County.	
Edwin Fletcher Abbott	Centralia	Marion	Wisconsin
*Charles Edward Allard	Roseclare	Hardin	Indiana
Benton Alfred	Urbana	Champaign	Illinois
*Wilbur Clinton Alvord	Bement	Piatt	Massachusetts
John F. Alexander	Alex Stat	Morgan	Illinois
*David Bally	Champaign	Champaign	Illinois
Herbert Ozias Barber	Rantoul	Champaign	Illinois
Delenson Elroy Barnard	Kankakee	Kankakee	Indiana
Joseph T Beasley	Champaign	Champaign	Illinois
Louis Henry Beidler	Champaign	Champaign	Illinois
George W. Brewer	Champaign	Champaign	Illinois
Frank Morgan Burroughs	Champaign	Champaign	New York
Hiram P. Blackburn	Rossville	Vermilion	Illinois
James Frederick Blake	Mount	Jo Davies	Illinois
Milo Benedict Burwash	Champaign	Champaign	Canada E.
Thomas Nathaniel Burwash	Champaign	Champaign	Canada E.
*John Wilbur Busey	Champaign	Champaign	Illinois
Oscar Fred. Cady	Champaign	Champaign	Illinois
James William Campbell	Springfield	Sangamon	Illinois
Willis Smith Chase	Chicago	Cook	N. Hampshire
Cassius C. Clendemin	Morrison	Whiteside	Illinois
Thomas Benton Columbia	Champaign	Champaign	Illinois
William Harrison Crayne	Urbana	Champaign	Indiana
*Joseph Buchanan Dare	Champaign	Champaign	Illinois
John Jefferson Davies	Freeport	Stephenson	Illinois
Joseph Martin Davidson	Tolono	Champaign	Illinois
*Frank Dexter Dole	Mattoon	Coles	Illinois
Ira Bardwell Donaldson	Morrison	Whiteside	Illinois
Henry N. Drewry	Mason	Effingham	Indiana
Henry Dunlap	Champaign	Champaign	Illinois
Ernest Sans Dunlap	Champaign	Champaign	Illinois
Herbert Eaton	Philo	Champaign	New Jersey
Ernest Eaton	Philo	Champaign	New Jersey
Elias Quincy Emerson	Champaign	Champaign	Massachusetts
Charles S. Emerson	Mahomet	Champaign	Illinois
John Leslie Evans	Decatur	Macon	Illinois
Charles Austin Falls	Urbana	Champaign	Kentucky
Alfred Murray Flagg	Moro	Madison	Illinois
Cyrus David Fry	Freeport	Stephenson	Pennsylvania
*Fayette Gere	Urbana	Champaign	Illinois
James E. Graham	Galena	Jo Daviess	Illinois
*Charles Payton Graham	Champaign	Champaign	Kentucky
James M. Goodspeed	Urbana	Champaign	Ohio
Charles Henry Hall	Danville	Vermilion	Indiana
William Townsend Hamar	Champaign	Champaign	Indiana
Miles Fayette Hatch	Blivens' Mills	McHenry	Illinois
Edmund Brooks Hazard	Lynden	Whiteside	Illinois
Robert Harrison Haslett	Springfield	Sangamon	Illinois
Edgar Lewis Hill	Watson	Effingham	Illinois
William H. Henrichsen		Morgan	Illinois
Charles W. Hoxsey	Macon	Effingham	Wisconsin
William Hubbard	Elgin	Kane	Illinois

CATALOGUE OF STUDENTS—CONTINUED.

Names.	Residence.		Nativity.
	City.	County.	
Robert G. Hulett	Morrison	Whiteside	Ohio
Marion Franklin Kirkpatrick	Champaign	Champaign	Illinois
Theodore Julius Kraft	Bellville	St. Clair	Illinois
James C. Ladd	Ringwood	McHenry	Illinois
Peter Winfield Lawver	Freeport	Stephenson	Illinois
Joseph Kirk Love	Sidney	Champaign	Ohio
George H. Lyman	Richland	Sangamon	Illinois
Edward Lynch	Wapella	Dewitt	England
John L. Lyon	Rockford	Stephenson	Massachusetts
Taylor Martin	La Moille	Bureau	Illinois
James Newton Mathews	Mason	Effingham	Indiana
James H. McCarkle	Fairmount	Danville	Illinois
Howard M. Montillius	Freeport	Stephenson	Illinois
Edwin F Moore	Tolono	Champaign	New York
Ernest Nelson	Canton	Fulton	Illinois
Henry Norris	Tolono	Champaign	N. Jersey
George H Pancake	Mahomet	Champaign	Illinois
*John Joshua Parish	Raleigh	Saline	Illinois
Calvin E. Parker	Philo	Saline	Massachusetts
Wildey Lemon Parke	Urbana	Champaign	Ohio
John Charles Patton	Paxton	Ford	Illinois
Clark Lewis Payton	Danville	Vermillion	Illinois
John J. Parsons	Marshall	La Salle	Illinois
Russell D. Peacock	Chicago	Cook	Illinois
Edward F. Phillips	Chicago	Cook	Illinois
Millard F. Porterfield	Sidney	Champaign	Pennsylvania
Elijah Newton Porterfield	Sidney	Champaign	Pennsylvania
Hiram C. Powell	Champaign	Champaign	Indiana
George D. Pratt	Mahomet	Champaign	N. Hampshire
Adolphus Lafayette Rader	Charleston	Cole	Tennessee
Isaac Stuart Raymond	Champaign	Champaign	Ohio
Willis Albert Reiss	Bellville	St. Clair	Illinois
George Martin Randall	Yellowhead	Kankakee	Michigan
Stephen Avery Reynolds	Belvidere	Boone	Wisconsin
Thomas Edwin Richards	Springfield	Sangamon	Illinois
Odas Riley	Urbana	Champaign	Illinois
Samuel Earhardt Rigg	Champaign	Champaign	Pennsylvania
Charles Wesley Rolfe	Oswego	Kendall	Illinois
James Simpson Romine	Urbana	Champaign	Illinois
*Reuben Roughton	Rantoul	Champaign	England
John Robinson Rowlen	Tolono	Champaign	Ohio
*Albert Russell	Urbana	Champaign	Illinois
Charles Elliott Sale	Newcomb	Champaign	Ohio
Edgar Sawyer	Tiskilwa	Fulton	Illinois
George Blanchard Scripps	Astoria	Fulton	Illinois
Luther Edgar Shinn	Urbana	Champaign	Illinois
Wilbur Thomas Shinn	Urbana	Champaign	Illinois
Howard Silver	Urbana	Champaign	Ohio
Charles Wallace Silver	Urbana	Champaign	Ohio
Edward G. Smith	Peru	La Salle	Illinois
Charles Carrol Smith	Freeport	Stephenson	Pennsylvania
Albert Alexander Snelling	Kinmundy	Marion	N Hampshire
*Henry Augustus Staples	Springfield	Sangamon	Maine
John Newton Swinford	Paxton	Ford	Illinois
*Thomas Stoddert	Charleston	Coles	Illinois
Riley Swisher	Butler	Butler	Illinois
James David Swearingen	Champaign	Champaign	Illinois
David Edwin Swyer	Bellville	St. Clair	Illinois
Jared Teeple	Woodstock	McHenry	Illinois
*Irving Terwilliger	Belvidere	Boone	Illinois
John R Trevett	Champaign	Champaign	Illinois
Samuel West Thompson	Homer	Champaign	Illinois
*Irwin Bedell Towle	Urbana	Champaign	New York
Lewis Cass Warner	Salem	Marion	Illinois
*Samuel Thompson Weber	Raleigh	Saline	Illinois
Samuel Judson Westlake	Springfield	Sangamon	Illinois
Jacob Norton Wharton	Bement	Piatt	Pennsylvania
Joseph C. Walker	Champaign	Champaign	Illinois
Oscar R. Wheeler	Versailles	Brown	Illinois
Cyrus W. Wheeler	Versailles	Brown	Illinois

CATALOGUE OF STUDENTS—CONTINUED.

Names.	Residence.		Nativity.
	City.	County.	
William*J. Weagley	Jacksonville		Illinois
Samuel Weaver White	Paxton	Ford	Ohio
James Alexander Williams	Urbana	Champaign	Illinois
Reuben O. Wood	Woodburn	Macoupin	Illinois
Paul Way Woody	Champaign	Champaign	Indiana
Harley Wilburn Yeager	Monticello	Piatt	Illinois

*Absent this year.

The names of members who have been expelled, or who have left without permission, are omitted from this catalogue.

APPENDIX.

The following courses of combined studies are here presented to aid such students as may need some assistance in making out courses for themselves. It must be remembered that each study taught in the University must be confined to its regular terms, and any selection of studies must be made with constant reference to this fact. The terms in which each study will be taught, can be ascertained by a reference to the courses in the several Departments.

Other courses of study belonging to institutions of well-known fame, are added as affording valuable suggestions.

AGRICULTURAL COURSE.

Three Suggested Courses of Collateral Study in Agriculture, prepared by Prof. Bliss.

"Chemistry is the corner-stone of Scientific Agriculture-"—DR. JNO. A. WARDER.

"Without a knowledge of Physics, of Chemistry, and of Agricultural Geology in the widest signification, is no understanding of Plant and Animal Life to be gained. The Natural Seiences can never be learned *thoroughly*, that is, so that practical application of them can be made in life, from books or lectures. The student will grasp, understand, and assimilate mentally what he has learned and read only when he *makes Chemical Experiments, Physical Experiment, dissects Plants, and investigates aad observes for himself.*

Practical knowledge is *thorough* knowledge. All *superficial* knowledge is *unpractical.* The farmer who wishes rational education, and does not devote at least a year exclusively and earnestly to the study of Physic, Chemistry, and Physiology, had better not pursue the Natural Sciences at all."—M. J. SCHLEIDEN.

The work laid down in the following courses is designed at once to supplement and explain the Lectures delivered from time to time on the various branches of Agriculture, and to afford such general education as is absolutely necessary to progress in any direction, and which must, for the present, be provided for students here, since they do not bring it with them.

Students desiring to remain but a single year and pursue special branches during that time, will be allowed to do so.

Persons wishing to spend the Fall and Winter terms of each year here, and the Spring term at home, will still be able to go on with their classes at the beginning of the succeeding year, though at some disadvantage.

A TWO YEARS' COURSE.

FIRST YEAR.—*First Term.*—Chemical Physics and Inorganic Chemistry. Structural and Physiological Botany. First four books of Davies' Legendre.

Second Term.—Organic Chemistry in text book, "How Crops Grow." Fifth book of Davies' Legendre. English Language.

Third Term.—Qualitative Analysis. Detection of the alkalies, alkaline-earths, earths, etc. Systematical Botany. Excursions and Collections. English Language.

SECOND YEAR.—*First Term.*—Qualitative Analysis continued. Detection and separation of the Elements. Chain Surveying and Mensuration. Geometrical Drawing. General Principles of Zoology (or German.)

Second Term.—General Principles of Geology. Vegetable Economy. How Plants Feed. Topographical Drawing. Animal Physiology, (or German.)

Third Term.—Geology of Illinois. Vegetable Economy. Entomology, (or German.)

THREE YEARS' COURSE.

FIRST YEAR.—*First Term.*—Chemical Physics and Inorganic Chemistry in text books. Structural and Physiological Botany. First four books of Davies' Legendre.

Second Term.—Organic Chemistry in text books. Vegetable Physiology. Fifth book of Davies' Legandre. English Language.

Third Term.—Qualitative Analysis. Detection of the alkalies, alkaline-earths, earths, etc. Systematic Botany. Excursions and Collections. English Language.

SECOND YEAR.—*First Term.*—Qualitative Analysis continued. Detection and Separation of the Elements. Chain Surveying and Mensuration. Geometrical Drawing. German.

Second Term.—Quantitative analysis of salts, minerals, ores, alloys, furnace products, etc. Vegetable Economy. German.

Third Term.—Quantitative analysis of soils, manures, ashes of plants, etc. Vegetable Economy. German.

THIRD YEAR.—*First Term.*—General Principles of Zoology. Plane Trigonomety one-half term. Entomology. French.

Second Term.—Principles of Geology. Tillage and Manures. French.

Third Term.—Geology of Illinois. Compass Surveying and Leveling. French.

A FOUR YEARS' COURSE.

FIRST YEAR.—*First Term.*—Chemical Physics and Inorganic Chemistry in text book. Structural and Physiological Botany. First four books of Davies' Legendre.

Second Term.—Organic Chemistry in text books. Fifth book of Davies' Legendre. How Crops Grow. English Language.

Third Term.—Qualitative Analysis. Detection of the alkalies, alkaline-earths, earths, etc. Systematic Botany. Excursions and Collections. English Language.

SECOND YEAR.—*First Term.*—Qualitative Analysis continued. Detection and Separation of the Elements. Chain Surveying and Mensuration. Geometrical Drawing. German.

Second Term.—Quantitative Analysis of salts, minerals, ores, alloys, furnace products, etc. Topographical Drawing. How Plants Feed. German.

Third Term.—Quantitative Analysis of soils, manures, ashes of plants, etc. How Plants Feed. German.

THIRD YEAR.—*First Term.*—Higher Physics. Plane Trigonometry one-half term. French.

Second Term.—Principles of Geology. Tillage and Manures. French.

Third Term.—Geology of Illinois. Excursions and Collections. Compass Surveying and Leveling. Maps and Plats of Farm Surveys. French.

FOURTH YEAR.—*First Term.*—General Principles of Zoology. Inductive Logic. English Literature.

Second Term.—Animal Physiology. Stock Feeding and Dairy produce. Meteorology. English Literature.

Third Term.—Entomology. Political Economy. English Literature.

GENERAL COURSE.

FIRST, OR FRESHMAN YEAR.

	REGULAR STUDIES.	OPTIONAL AND EXTRA.
1ST TERM—	Trigonometry and Surveying.	
	Structural Botany.	
	Cicero's Orations against Cataline.	
	French.	Greek.
2D TERM—	Trigonometry and Analytical Geometry.	
	Systematic Botany.	
	Cicero's Orations.	
	French	Greek.
3D TERM—	Systematic Botany.	
	Analytical Geometry completed.	Greek.
	Geometrical Drawing.	
	French Literature.	
	Selections from Virgil.	

SECOND, OR SOPHOMORE YEAR.

1ST TERM—	Mechanics.	
	Chemistry. Zoology.	Livy.
	German.	Greek.
2D TERM—	Chemistry.	
	Entomology, etc.	Livy; Horace.
	Physics—Mechanics.	Greek.
	German.	
3D TERM—	Mineralogy.	
	Physic—Rhetoric.	
	German Literature.	Horace and Juvenal.

THIRD, OR JUNIOR YEAR.

1ST TERM—Astronomy.
Geology.
English Literature.
Ancient History.

2D TERM—Geology
Mediæval History.
Meteorology.
English Literature.

3D TERM—Logic
Physical Geography.
Modern History.
English Literature.

FOURTH, OR SENIOR YEAR.

1ST TERM—Mental Philosophy and Science of Education.
Constitutional History of England and of the United States.
Elements of Criticism.
2D TERM—Moral Philosophy.
History of Civilization.
Civil Polity; Constitution of the United States.
3D TERM—History of Philosophy.
Modern Philology.
Constitutional Law.
History of Inductive Sciences.

COURSE OF INSTRUCTION

IN MICHIGAN AGRIGULTURAL COLLEGE.

FRESHMAN CLASS.

FIRST HALF YEAR.—Algebra, Robinson; History, Weber; Geometry Robinson; Book-keeping, Bryant & Stratton.
SECOND HALF YEAR.—Trigonometry, Robinson; Surveying, Davies; Practical Agriculture; Geology, Dana.

SOPHOMORE CLASS.

FIRST HALF YEAR.—English Literature, Chambers, Spaulding; Botany, Gray; Elementary Chemistry, Youmans.
SECOND HALF YEAR.—Entomology, Harris; Analytical Chemistry, Fresenius; Botany, Gray, Darlington, and Lindley; Horticulture.

JUNIOR CLASS.

FIRST HALF YEAR.—Physics, Snell's Olmstead; Agricultural Chemistry, Johnstone; Inductive Logic, Herschel.
SECOND HALF YEAR.—Physics, Miller; Rhetoric, Whately; Day's Praxis; Animal Physiology, Dalton.

SENIOR CLASS.

FIRST HALF YEAR.—Zoology, Carpenter; Practical Agriculture; Mental Philosophy, Wayland; Astronomy, Snell's Olmsted; Landscape Gardening, Downing, Kemp.
SECOND HALF YEAR.—Civil engineering, Mahan; Moral Philosophy, Haven; Political Economy, Carey, Walker; French, Fasquelle.

COURSE OF STUDY AND INSTRUCTION

IN THE MASSACHUSETTS AGRICULTURAL COLLEGE.

FRESHMAN YEAR.

FIRST TERM.—Algebra; Human Anatomy and Physiology; Chemical Physics.

SECOND TERM.—Geometry; French; Chemistry.

THIRD TERM.—Geometry; French; Botany; Lectures upon Hygiene, Chemistry, Botany and Agriculture; and Exercises in Orthography, Elocution and English Composition, during the year.

SOPHOMORE YEAR.

FIRST TERM.—German; Agriculture; Commercial Arithmetic and Book-keeping.

SECOND TERM.—German; Trigonometry; Analytical Chemistry.

THIRD TERM.—Mensuration; Surveying; Anaylitical Chemistry; Zoology and Drawing; Lectures upon Comparative Anatomy, Diseases of Domestic Animals, Organic Chemistry and Market Gardening; Exercises in English Composition and Declamation, during the year.

JUNIOR YEAR.

FIRST TERM—Physics; French or German; Agricultural Chemistry, Drawing.

SECOND TERM.—Physics; Rhetoric; Horticulture.

THIRD TERM.—Astronomy; Systematic Botany; History of the United States; Lectures upon Physics, Mineralogy, the Cultivation of the Vine, and Fruit and Forest Trees, and Useful and Injurious Insects; and Exercises in English Composition and Debate, during the year.

SENIOR YEAR.

FIRST TERM.—Intellectual Philosophy; History; Physical Geography.

SECOND TERM.—Moral Philosophy; Political Geography; The Civil Polity of Massachussetts and the United States.

THIRD TERM.—Geology; Engineering; Political Economy; Lectures upon Stock Farming, Architecture, Landscape Gardening, Geology and English Literature; and Exercises in Original Declamation and Debate, during the year.

Exercises in Gymastics, Military Tactics, and the various operations of the Farm and Garden, through the course.

COURSE OF INSTRUCTION

IN THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

FIRST YEAR.—Mathematics. Algebra. Solid Geometry. Trigonometry, Elementary Mechanics. Chemistry. English. German. Descriptive Geometry. Mechanical Drawing. Free-hand Drawing.

SECOND YEAR.—Mathematics. Spherical Trigonometry. Analytical Geometry of two and three dimensions. First Principles of the Differential and Integral Calculus. Descriptive Astronomy. Surveying. Physics. Chemistry. English. French. German. Descriptive Geometry. Mechanical Drawing. Free-hand Drawing.

THIRD YEAR.—1. *Course in Mechanical Engineering.*—Mechanism. Mathematics. Differential and Integral Calculus. Analytic Mechanics. Applied Mechanics. Descriptive Geometry. Drawing. Physic. Geology. English. Constitutional History. French. German.

2. *Course in Civil and Topographical Engineering.*—Engineering. Mathematics. Applied Mathematics. Spherical Astronomy. Descriptive Geometry. Drawing. Physics. Geology. English. Constitutional History. French. German.

4. *Course in Mining Engineering.*—Engineering. Descriptive and Determinative Mineralogy Assaying. Quantitative Chemical Analysis. Metallurgy. Mathematics Applied Mechanics. Drawing. Physic. Geology. English. Constitutional History French German.

5. *Course in Building and Architecture.*—Architectural Design. Construction. Drawing. Mathematics. Applied Mechanics. Descriptive Geometry. Physics. Geology. English. Constitutional History. French. German.

6. *Course in Science and Literature.*—Mathematics. Chemistry. Physics. Architectural Design. History. Drawing. Physcs. Geology. English Constitutional History. French. German.

FOURTH YEAR.—1. *Course in Mechanical Engineering,*—Machines. Motors. Building Materials. Descriptive Geometry. Drawing. Political Economy. Natural History. French. German.

2. *Course in Civil and Topographical Engineering.*—Engineering. Machinery and Motors. Building Materials. Descriptive Geometry. Drawing Political Economy. Natural History. French. German.

4. *Course in Mining Engineering.*—Mining. Machinery and Motors. Engineering. Chemistry. Geology. Building Materials.. Drawing. Political Economy. Natural History. French. German.

5. *Course in Building and Architecture.*—Architectural Design. Professional Practice. Drawing. Engineering. Desscriptive Geometry. Warming, Lighting, Ventilating, Acoustics. Building Materials. Political Ecnomy. Natural History. French. German.

6. *Course in Science and Literature.*—The Higher Mathematics. Chemistry. Physics. Architectural Design. Mental Science. Building Material. Drawing. Political Economy. Natural History. French. German.

COURSE IN CIVIL ENGINEERING

IN RENSSELAER POLYTECHNIC INSTITUTE.

FOUR YEARS.

DIVISION D.

WINTER SESSION.—Mathematics—Davies' Bourbon's Algebra—Chapters VI–IX, inclusive; Davies' Legendre's Geometry—Books IV VI, inclusive. Plane Graphic Geometry—Warren's Elementary Plane Problems. English Language—Quackenbos' English Composition and Rhetoric, commenced. French Language—Fasquelle's French Grammar—Lessons I–L, inclusive. Geodsey,—Line Surveying, Elementary Practice. Geometrical Drawing—Plane Problems—Warren's Drafting Instruments and Operations.

SUMMER SESSION.—Mathematics—Davies' Legendre's Geometry—Books VII–IX, inclusive. Mensuration—Use of Mathematical Tables. Analytical Trigonometry, Plane and Spherical Trigonometry. Descriptive Geometry—Warren's Elementary Projections. Physics—Loomis' Natural Philosophy. English Language—Quackenbos' English Composition and Rhetoric, completed. French Language—Fasquelle's FrenchGrammar, completed. Geodesy—Line Surveying, Chain Surveys. Geometrical Drawing—Elementary Projections. Construction Drawing—Elements of Structures.

DIVISION C.

WINTER SESSION.—Mathematics—Higher Algebra. Descriptive Geometry Orthographic Projections. Physics—Physics of Heat. English Language—English Composition; Logical and Rhetorical Criticism. French Language—English Translations, Reading of French Scientific Authors. Geodesy—Line Surveying, Theory, Compass Surveys. Geometrical Drawing—Orthographic Projections. Topographical Drawing—Elementary Drawing, Topographical Plans.

SUMMER SESSION.—Mathematics—Analytical Geometry. Descriptive Geometry—Orthographic Projections. Chemistry—Inorganic Chemistry. Natural History—Botany. English Language—English Composition; Logical and Rhetorical Criticism. French Language—English Translations; French Composition. Geodesy—Adjustment and Use of Instruments, Line Surveying, Topographical Sketching, Farm Surveys. Geometrical Drawing—Orthographic Projections. Topographical Drawing—Map of Farm Surveys.

DIVISION B

WINTER SESSION.—Mathematics—Differential Calculus, Integral Calculus, Calculus of Variations. Descriptive Geometry- Shades and Shadows. Physics—Electricity, Terrestrial Magnetism, Statical and Dynamical Electricity. Chemistry- Practical Chemistry, Qualitative Analysis, Blow-pipe Analysis, Determinative Minerology. Geodesy—Practical Trigonometry, Leveling, Topographical Surveying. Geometrical Drawing—Shades and Shadows, Machine Drawing, Elements of Machines. Topographical Drawing—Maps of Topographical Surveys.

SUMMER SESSION.—Rational Mechanics—Mechanics of Solids, Mechanics of Fluids. Descriptive Geometry—Linear Perspective. Physics—Acoustics, Optics. Astronomy—Descriptive Astronomy. Natural History—Descriptive Geology. Geodesy—Hydrographical Surveying, Theory and Practice. Geometrical Drawing—Perspective; Construction Drawing, Bridge Drawing. Topographical Drawing—Colored Topography.

DIVISION A.

WINTER SESSION.- Mathematics—Method of Least Squares. Astronomy—Spherical Astronomy, Practical Astronomy. Physical Mechanics—Mechanics of Solids—Friction, Strength of Materials; Mechanics of Fluids—Practical Hydraulics, Practical Pneumatics. Machines—Theory of Machines. Descriptive Geometry—Stone Cutting. Natural History—Physical Geography. Philosophy—Intellectual Philosophy. Geometrical Drawing—Stone Cutting. Topographical Drawing—Maps of Hydrographical Surveys.

SUMMER SESSION.—Machines—Theory of Prime Movers, Designs for, and reviews of Special Machines. Constructions—Stability of Structures, Construction of Engineering and Architectural Works, Designs for, and reviews of Special Works. Road Engineering—Common Roads. Railroads. Chemistry—Technical Chemistry. Geology—Practical Geology, Technical Geology. Philosophy—Ethical Philosophy. Topographical Drawing—Plans, Profiles, and Sections of Railway Surveys.

COURSE IN MECHANICAL ENGINEERING,

IN RENSSELAER POLYTECHNIC INSTITUTE.

FOUR YEARS.

DIVISION D.

THE COURSE IDENTICAL WITH THAT IN CIVIL ENGINEERING.

DIVISION C.

THE COURSE IDENTICAL WITH THAT IN CIVIL ENGINEERING.

DIVISION B.

WINTER SESSION.—Mathematics—Differential Calculus, Integral Calculus, Calculus of Variations. Descriptive Geometry—Shades and Shadows. Physics—Electricity; Terrestial Magnetism, Statical and Dynamical Electricity. Chemistry—Practical Chemistry, Qualitative Analysis, Blow-pipe Analysis, Determinative Minerology. Geodesy—Practical Trigonometry, Leveling, Topographical Surveying. Geometrical Drawing—Shades and Shadows, Machine Drawing, Elements of Machines. Topographical Drawing—Maps of Topographical Surveys.

SUMMER SESSION.—Rational Mechanics—Mechanics of Solids; Mechanics of Fluids. Machines—Cinematics. Descriptive Geometry—Linear Perspective. Physics—Acoustics, Optics. Astronomy—Descriptive Astronomy. Natural History—Descriptive Geology. Geometrical Drawing—Perspective; Machine Drawing, Elements of Machines.

DIVISION A.

WINTER SESSION.—Mathematics—Method of Least Squares. Astronomy—Spherical Astronomy. Physical Mechanics—Mechanics of Solids; Friction, Strength of Materials; Mechanics of Fluids; Practical Hydraulics, Practical Pneumatics. Machines—Construction of Machines, Location of Machines, Theory of Machines, Efficiency of Machines. Philosophy—Intellectual Philosophy. Geometrical Drawing—Machine Drawing, Complete Machines.

SUMMER SESSION.—Mechanics—Theory and Construction of Prime Movers, Designs and Estimates for, and reviews of Special Machines. Constructions Stability of Structures. Chemistry—Technical Chemistry, Chemistry of the Materials and Processes of Heating and Illumination. Philosophy—Ethical Philosophy. Geometrical Drawing—Machine Drawing, Complete Machines.

CLASSICAL COURSE OF INSTRUCTION

IN HARVARD UNIVERSITY.

FRESHMAN CLASS.

FIRST TERM.—Greek.—Xenophon's Memorabilia, Homer's Odyssey, Goodwin's Greek Moods and Tenses, Exercises in writing Greek. Latin.—Livy, (Lincoln's Selections], Cicero's Epistles, Ramsay's Elementary Manuel of Roman Antiquities, Zumpt's Grammar, Exercises in writing Latin. Mathe-

matics.—Pierce's Geometry, Pierce's Algebra, begun. French.—Otto's Grammar, Moliere, Racine, Modern French Comedies. Elocution. Ethics.—Champlin's First Principles of Ethics, Bulfinch's Evidences of Christianity. Integral Education.—Lectures.

SECOND TERM.—Greek. Lysias, Homer's Odyssey, Arrian's Anabasis, Greek Antiquities, Goodwin's Greek Modes and Tenses, Exercises in writing Greek. Latin.—Horace, Odes and Epodes, Cicero's Tusculan Disputations, Zumpt's Grammar, Ramsay's Elementary Manual of Roman Antiquities, Exercises in writing Latin. Mathematics.—Pierce's Algebra, finished (including Logarithms, Pierce's Plane Trigonometry. History, in French.—Histoire Grecque par Duruy. Elocution.

SOPHOMORE CLASS.

FIRST TERM.—Rhetoric.—Campbell's Philosophy of Rhetoric (Second Book), Themes. History.—Roman History. Chemistry.—Cooke's Chemical Physics. Elocution. French.—Histoire de la Litterature Francaise.

Elective Studies.—Pure Mathematics.—Pierce's Plane and Spherical Trigonometry and Navigation and Surveying, with Bowditch's Tables, Puckle's Conic Sections, Salmon's Conic Sections. Applied Mathematics.—Pierce's Plane Trigonometry and Surveying, with Bowditch's Tables, Smith's Mechanics. Greek.—The Prometheus of Aeschylus, the Birds of Aristophanes, Felton's Greek Historians. Exercises in writing Greek. Latin.—Cicero de Officiis, Quintilian, Zumpt's Grammar, Exercises in writing Latin.

SECOND TERM.—Rhetoric.—Whatley's Rhetoric, Themes, Reading in English Literature. Philosophy.—Stewart's Philosophy of the Mind. Chemistry.—Eliot and Storer's Elements of Chemistry, Lectures. German.—Krauss' German Manual, Rolker's German Reader. Elocution.

Elective Studies.—Pure Mathematics.—Puckle's Conic Sections, Salmon's Conic Sections. Applied Mathematics.—Conic Sections, Smith's Mechanics, Goodwin's Elementary Dynamics. Greek. Demosthenes, Grote's History of Greece, Vol. XI. (chapters 86–90), Lysias, Greek Composition. Latin.—Terence, Cicero, Horace, Exercises in writing Latin.

JUNIOR CLASS.

FIRST TERM.—Herschel's Outlines of Astronomy, last edition, Lectures on Mechanics.* Rhetoric.—Themes. Chemistry.—Lectures,

Elective Studies.—Mathematics.—Pierce's Algebra, chapter VIII, Pierce's Curves and Functions, Vols. I. and II. Ancient History.—Polybius, Greek Composition. Greek.—Aeschines and Demosthenes on the Crown, Greek Composition. Latin.—Pliny's Letters, Martial, Latin Exercises and Extemporalia. Chemistry.—Galloway's Qualitative Analysis, with instructions in the Laboratory. Natural History. English Language.—Thorpe's Analecta Anglo-Saxonica, Morris' Specimens of Early English, The Bible, Spencer, Shakespeare. German.—Krauss' German Manual. Spanish.—Gil Blas, Josse's Grammar and Exercises, (Sales' ed). Italian.—Dall's Ongaro's La Rosa dell' Alpi, Cuorre's Grammar and Exercises.

SECOND TERM.—Philosophy.—Forensics. Physics.—Lardner's Course of Natural Philosophy, (Optics), Lectures on Hydrostatics, Pneumatics, etc.

Elective Studies.—Mathematics.—Pierce's Curves and Functions, Vols. I. and II. Ancient History.—Plutarch, Greek Composition. Greek.—The Electra of Sophocles, Plato, Greek Composition. Latin.—Plautus, Latin Exercises and Extemporalia. Chemistry.—Galloway's Qualitative Analysis, with instruction in the Laboratory. Natural History. English Language.—Studies of the First Term continued. German.—Simonson's Deutsches Balladenbuch. Spanish.—Don Quijote, Sale's edition.

*The full course of Lectures in this department appears only by consulting the Catalogue for two successive years, with reference to the same student.

SENIOR CLASS.

FIRST TERM.—Logic and Philosophy.—Bowen's Logic, Bowen's Political Economy, Forensics. Physics.—Lectures on Optics and Acoustics. History. —Constitutional History of the United States.

Elective and Extra Studies.—Mathematics.—Pierce's Curves and Functions. Greek.—The Agamemnon of Aeschylus, the Antigone of Sophocles, Greek Composition. Latin.—Quintilian, Cicero against Verres, Latin Exercises and Extemporalia. German.—Schiller's Wilhelm Tell, Geothe's Faust, Lectures on German Grammar. Spanish.—Gil Blas, Sale's Grammar. Italian.—Dall' Ongara's La Rosa dell' Alpi, Cuorre's Grammar and Exercises. Modern Literature.—Lectures. Patristic and Modern Greek. Geology.—Lectures. Anatomy.—Lectures.

SECOND TERM.—Philosophy.—Hamilton's Metaphysics, Bowen's Ethics and Metaphysics. History.—Modern History. Religious Instruction. Rhetoric. —Themes.

Elective and Extra Studies.—Mathematics.—Pierce's Analytic Mechanics. Greek.—Thucydides, Greek Composiiion. Latin.—Lucretius, Latin Exercises and Extemporalia. German.—Goethe's Faust, Otto's German Grammar, Lessing's Emilia Galotti and Laokoon. Spanish.—Calderon's El Principe Constante, Calderon's El Magico Prodigioso. Italian.—Dante. Zoology.—Lectures. Modern Literature.—Lectures. Patristic and Modern Greek.

The Hebrew Language is taught by Professor Noyes to those who desire to learn it.

COURSES IN CIVIL ENGINEERING AND MECHANICS,

IN SHEFFIELD SCIENTIFIC SCHOOL.

JUNIOR YEAR.

A. CIVIL ENGINEERING. *First Term.*—French and German—(see Select Course.) Mathematics—Descriptive Geometry (Church's), Analytical Geometry of Three Dimensions. Surveying—Higher Surveying, Topographical Surveying. Drawing—Topographical.

Second Term.—French—(See Select Course). Mathematics—Davies' Shades, Shadows, and Linear Perspective, Differential Calculus. Astronomy. Norton's Astronomy with practical problems.

Third Term.—French—(See Select Courses). Mathematics—Linear Perspective (continued), Isometrical Projection, Differential and Integral Calculus. Drawing—Isometrical and Mechanical.

B. MECHANICS.—The same as the course in Civil Engineering, with the omission of Higher Surveying, Topographical Surveying, Topographical Drawing and Astronomy, and the substitution of Mechanics (Peck's Elements), Mechanical Drawing, Metallurgy, and Principals of Mechanics.

SENIOR YEAR.

A. CIVIL ENGINEERING.—*First Term.*—French—Selections. Field Engineering and Surveying—Hench's Field Book for Railroad Engineers. Location of Roads, Geodetic Surveying. Mechanics—Peck's Elements, Thermodynamics. Geology—Dana, Drawing—Architectural.

Second Term.—Mechanics—Peck's Elements (continued), Application of Calculus to Mechanics, Principles of Mechanism, Theory of Steam Engine.

Civil Engineering—Strength of Materials, Bridge Construction, Stability of Arches, Stone Cutting, with graphical problems. Geology—Dana (continued).

Third Term.—Mechanics—Mechanics applied to Engineering (Weisbach, Vol. II.), Prime Movers. Civil Engineering—Stone Cutting (continued), Building Materials (lectures), Designs of Structures, Mahan's Civil Engineering. Drawing—Structural.

B. MECHANICS.—*First Term.*—Analytical Mechanics, Machinery, Thermodynamics. Drawing—Architectural.

Second Term.—Analytical Mechanics (continued), Strength of Materials, Theory and Construction of Steam Engine, Examination and Reports of Machines, Mechanical Practice.

Third Term.—Prime Movers, Mill Work, Designs of Machines.

COURSE IN AGRICULTURE.

JUNIOR YEAR.

FIRST TERM.—Agriculture—Chemistry, Structure, and Physiology of the Plant, Water Atmosphere and Soil in their relation to Vegetable Production, Improvement of the Soil, Tillage, Draining, Amendments and Fertilizers, Lectures. Experimental and Analytical Chemistry—in their Agricultural Applications, Daily Laboratory Practice. Zoology—Lectures. French—commenced. German—Woodbury's Method. Meteorology—Academical Lectures.

SECOND TERM.—Agriculture—Chemistry and Physiology of Domestic Animals, Digestion, Respiration, Assimilation and Excretion; Composition, Preparation and Value of the kinds of Fodder; Milk, Butter, Cheese, Flesh and Wool, as Agricultural products, Lectures. Experimental Chemistry—Laboratory Practice. French and German—continued. Physical Geography—Lectures. Zoology—Lectures.

THIRD TERM.—Horticultural and Kitchen Gardening—Propagation, training and culture of Fruit Trees, the Vine, Small Fruits and Vegetables, Lectures. Mineralogy—Lectures and practical Exercises. Experimental Chemistry—Laboratory Practice. French or German—continued. Drawing—Free Hand Practice. Excursions.—Botanical, Zoological, &c.

SENIOR YEAR.

FIRST TERM.—Agriculture—The staple grain, forage, root and fiber crops of the Northern States, their varieties, soils adapted for them, preparation of soil, seeding, cultivation, harvesting, and preparation for market. Lectures. Agricultural Zoology—Origin and Natural History of Domestic Animals, Insects useful and injurious to Vegetation, Lectures. Geology—Dana's Manual. French or German—Selections. Excursions—Agricultural, Zoological, Geological, &c.

SECOND TERM.—Agriculture—Raising and Care of Domestic Animals, characteristics and adaptation of Breeds, Cattle for Beef and Draught, The Dairy, Sheep for Wool and Mutton, Horses, Swine, pasturing, soiling, stall feeding, Tobacco, Hops, &c., Lectures. Forestry—Preservation, culture and uses of Forests and Forest Trees, Lectures. Human Anatomy and Physiology—Lectures Agricultural Botany—Weeds and Noxious Plants, Lectures. French or German.

THIRD TERM—Rural Economy—History of Agriculture and Sketches of Husbandry in Foreign Countries, Adaptation of Farming to soil, climate, market, and other natural and economical conditions, Systems of Husbandry, Stock, Sheep, Grain, and mixed Farming, Lectures. Farm Accounts—Lectures and practical exercises. Excursions—Agricultural, Geological, Zoological and Botanical. Examinations in the studies of the Course.

MEETING OF THE BOARD OF TRUSTEES.

ILLINOIS INDUSTRIAL UNIVERSITY,
Urbana, Champaiyn Co., Ill., Nov. 18, 1868.

The Board of Trustees of the Illinois Industrial University met pursuant to the call of the Executive Committee, in the Library Hall, at 9 o'clock, A. M.

After the reading of the Scriptures and prayer, upon calling the roll, the following members answered to their names:

Allen	Goltra
Blackburn	Hayes
Brown, of Chicago	Johnson
Brown of Pulaski	Mahan
Burchard	McMurray
Cobb	Pickrell
Cunningham	Pullen
Dunlap	Quick
Edwards	Scroggs
Flagg	VanOsdell
Galusha	The Regent

The following named gentlemen were absent:

Bateman	Lawrence
Brayman	McConnell
Burroughs	Topping
Hammond	The Governor
Hungate	

Mr. Harding being deceased.

The Regent presented the following report relating to the progress and present wants of the University:

GENTLEMEN:—Though not positively required from me by any rule of the Board, it seems fitting that I shall report to you those facts concerning the University and its several departments which will enable you to judge of its present wants, and to act intelligently upon the several matters which require your attention.

DOINGS OF EXECUTIVE COMMITTEE.

Since your meeting in March, the Executive Committee has

held three meetings; the first held the 12th of May, the second was held June 11th, and the third September 16th.

At the meeting in May, the committee audited the accounts then due. It was ordered by the committee that the students might be employed at overwork at 12½ cents an hour. The Regent was instructed to take measures to secure as favorable terms as possible for students' uniforms. The Regent and head farmer were authorized to employ a gardener, and $400 were appropriated for repairing farm buildings and fences. A portion of the trees having been received from Mr. Dunlap's nursery, a committee was appointed to confer with the supplier concerning the prices for the same.

At the meeting of June, the accounts were audited to that date. The issue of a circular and catalogue was ordered, and appropriations were made for drums and fifes. A committee was appointed to inquire into the quality and cost of tile wanted for draining farm and garden. It was ordered that application should be made to the Trustees to sell 50,000 acres of scrip at not less than $1 10 per acre.

These orders were subsequently carried out, but no sale of scrip has yet been made under the authority thus obtained. The committee also ordered that Assistant Professors shall be paid a salary of $1200 per annum.

At the meeting in September all accounts were audited to that date, and appropriations were voted as follows:

For Chemicals	$368 69
" Chemical apparatus	439 45
" a Microscope, not exceeding	250 00
" Forcing pit	250 00
" Drainage	1200 00
" Surveying instrument	400 00

Judge Cunningham and Mr. Periam were appointed a committee to rent the Griggs farm for the next year. A meeting of the Trustees was ordered to be called for the 18th of November. Alterations were authorized to be made to provide a dining room in the basement, and to fit up the old dining room for the library and reading room, with portable furnace to warm the class rooms and chapel above it. The purchase of additional chairs, and of seed wheat, was also ordered. The Professor of Chemistry was instructed to keep an account of chemicals used by each student,

and that the question of price to be charged for these chemicals, be left to be decided by the full Board.

The orders have been carried out, except that relating to drainage. A correspondence was opened with the several manufacturers of drain tile, to ascertain the costs of the several kinds of tile, and Prof. Shattuck proceeded to make a topographical survey of the farm and garden, preparatory to the adoption of some suitable system of drainage. We shall be ready to begin the work whenever the weather will permit.

The bills for the several purchases made under the orders of the Executive Committee will be presented to the Board for approval.

Under the authority granted, Mr. Thomas Franks, a thoroughly instructed and competent English gardener was employed, and is now at work, at a salary of $50 a month.

It may be stated here, that considerable donations of bedding plants and shrubs have been received from several prominent Horticulturists in the State. Other donations of valuable tools and implements for the farm and garden have been received from gentlemen engaged in the manufacture of agricultural implements, and donations of text and library books have been made by several eminent publishing houses.

The following is a list of donations received to this date:

L. Vandesyde, Calumet, 1 set reed mats.

Emerson & Co., Rockford, 1 Jones' hand corn planter.

Fuller & Palmer, Chicago, 50 sash for garden use.

R. S. Wheatley, Du Quoin, 1 subsoil and garden plow.

Barlow, Wood & Co., Quincy, 1 Vandever's corn planter with drill attachment.

Furst & Bradley, Chicago, 1 walking cultivator.

Clark & Utter, Rockford, 1 Gorham seeder and cultivator, combined.

Wm. Lintner, Decatur, 1 farm pump.

J. J. Inglehart, Matteson, 1 Granger patent rotating harrow.

Hubbard & Finch, Champaign, 1 two horse cultivator, Frazier's patent, and 1 Kalamazoo three horse clevis.

Robert Douglas, Waukegan, collection evergreen seeds.

S. Wilbur, Momence, duplicate collection of flower seeds.

D. M. Ferry & Co., Detroit, Mich., collection of flower and garden seeds, and 1 package of Behera wheat, imported from Egypt.

T. W. Lachore, Blue Island, 2 wheel hoes.

B. Dornblazer, Joliet, 1 Hoosier riding or walking cultivator, and 1 double shovel plow.

J. C. Wilson, Crete, 1 patent rotary harrow.

Phœnix, Bloomington, 100 rose bushes, and collection of flowering shrubs and bedding plants.

Edgar Sanders, Chicago, 100 select bedding plants.

P. S. Meserole, Chicago, 1 Allen's Weeder, 1 Hexamer pronged hoe.

Joseph Mainhofer, Ottawa, 1 Messenger or Gopher cultivator, with extra shares.

John Deere, Moline, 1 improved P. P. plow.

O. M. Railsback, Champaign, 300 select green house and bedding plants.

Jacob Strayer & Co., South Bend, Ind., 1 Statesman force feeding grain drill, grass sower and surveyor.

Fairbanks, Greenleaf & Co., 1 set of grocer scales, 1 set counter scales, discount on hay scales, $75.

H. C. Rector, Champaign, 1 Blevin's patent plow and cultivator.

M. A. & J. M. Cravath, Bloomington, 1 revolving cultivator and hilling machine.

M. Dorsett, Chicago, 1 model straw rick, with ventilating tube for preserving hay or grain, and movable roof.

M. Cochrane, Architect, 1 fine colored lithograph of new State Capitol.

Valuable text and library books received from Sheldon & Co., New York, R. S. Barnes, New York, D. Appleton, New York, Harper Bros., New York, Ivison & Phinney, New York.

S. M. Hayward & Son, Pana, Ill., red Genesee winter wheat, for seed.

A. Blumenshein, Florist, Chicago, collection of green house plants.

Edgar Sanders, Chicago, collection of bulbs,

Edgar H. Potter, Kalamazoo, Mich., improved three horse clevis.

DOINGS OF OTHER COMMITTEES.

The committee on Building and Grounds met in conjunction with the Executive committee, both in April and June. They recommended several alterations and improvements in the University buildings, which, having been considered and ordered by the Executive committee, were afterwards carried into effect. They also recommended the erection of a building to be used partly as a carpenter's shop, and partly to shelter tools and one team. This building, under an order of the Executive committee, has been erected, and is now in use.

The committee on Faculty and Studies has also held several meetings. The time when Prof. Powell should enter upon service having been referred by the Board to this committee, an interview was held with Prof. Powell, and on his full acceptance of the appointment tendered him by the Board, he was put on service at once, but at his own request was detailed to conduct the scientific expedition he was already engaged in. The sum of six hundred (600) dollars was voted to him as a salary in full for

the time he should be absent, it being agreed that this sum should also be in lieu of the appropriation he had asked from this Board in behalf of the University, to the several collections proffered by Prof. Powell as an inducement for such appropriations. Subsequently Congress passed a law granting some material aid to this expedition, and giving it much larger power to secure valuable collections. Prof. Powell's absence has delayed a reception of the collections made by him in his former expedition.

Prof. Sewall having declined the appointment tendered him to the chair of Chemistry, the committee, under the authority given by the Board, secured the services of Prof. A. P. S. Stuart, late of the Lawrence Scientific School, in Harvard University, and now recommend Prof Stuart to the Board for permanent appointment to the chair of Chemistry.

The committee also secured the services of Col. S. W. Shattuck, late of Norwich University, as Assistant Professor of Mathematics, and of Prof. Thos. J. Burrill, late Principal of the Urbana High School, as Assistant Professor of Natural History and Botany, and now ask the appointment of these gentlemen to these places for the current year. In accordance with a resolution of the Board, the committee has employed Capt. E. Snyder as Accountant and teacher of Book-keeping, and his appointment for the current year is cordially recommended. The salary of Profs. Shattuck and Burrill was fixed at $1,200 per annum, and that of Capt. Snyder at $1,000. I would respectfully suggest that, as Capt. Snyder has been called upon to give instruction in German, is doing full service as a teacher, that the title and salary of an assistant professor be accorded to him. The appointments tendered by you to Dr. Warden and Mr. Eggleston have been accepted by these gentlemen, and Dr. Warder will give his first course of lectures in January next. The time for the lectures of Mr. Eggleston has not yet been fixed.

Prof. Atherton having accepted a Professorship in an Eastern college has given notice of his resignation, to take effect the 1st of January next. As chairman of the Library committee, and under advice from the committee, I have recently expended $600 of the library fund, set apart by you from the matriculation fees, for such books as seemed most needful, including a large number of agricultural works. There is a small unexpended balance of this fund, which will enable us to provide the reading room with a necessary supply of periodicals. It is of vital importance to the

character and success of the University that large appropriations be made, at the earliest practicable moment, to supply the library with needful books. Neither teachers nor students can do the best work without a ready access to the full fountains of the best learning in all the departments of study. No feature of an institution of learning is more attractive to either the highest grade of instructors or students than an ample and well selected library. The following is the list of Books lately purchased by the Library committee:

AGRICULTURAL.

Fuller's Grape Culturist..... Rabbit Fancier.....Bement.
Fuller's Strawberry Culturist ..... Method of making Manure..... Bommer.
Gennan's Milch Cows..... New Book of Flowers.....Breck.
Herbert's Hints to Horsekeepers ..... Country Life .....R. M. Copeland.
Hop Culture .... Horse Doctor..... ....Dadds.
Agricultural Chemistry ..... Johnson. Cattle " .... "
Elements of Agricultural Chemistry...Johnson. Muck Manual.....Dana.
How to Build Hothouses, ...Lochar. Dog and Gun ....Hooper.
My Vineyard at Lakeview..... ..... The Cranberry.....Eastwood.
Onion Culture..... .. .. Western Fruit Growing..... .... Elliott.
Peat and its Uses,.....Johnson. Farm Drainage..... .....French.
Pedders Land Measurer..... Country Life .....Cooper.
Randall's Sheep Husbandry..... Cotton Cultivation.....Ure.
Randall's Fine Wool Sheep Husbandry..... Horticulture.....Lindley.
Richardson on the Dog..... Fields, Garden and Woodlands.....A Lady.
Miniature Fruit Garden.....Rivers. Poultry a Meat Supply..... ... .
Domestic Poultry .....Sanders. Horse Portraiture.....Simpson.
Schenck's Gardeners' Text Book..... Farmer's Library .....
Food of Animals.....Thompson. The Horse, and How to Feed Him ..Armatage.
Tobacco Culture..... Grape Culture.....Mead.
On the Horse..... Youatt & Spooner. Fruit, Flowers and Farming.....Beecher.
On Cattle.....Youatt & Martin. Our Neighborhood..... ....
On the Hog. .....Youatt. Home Pets.....Beaton.
Flax Culture..... .... Age of Horses.....L. Brandt.
Charlton's Grape Culture..... ..... Horsehoeing Husbandry.....Jethro Thull.
Tim Bunker's Papers..... Domestic Animals.....Prof. Low.
How Crops Grow .....Johnson. The Complete Grazier.....
The Percheron Horse .....Huys. The Mule ....Riley.
Variations of Animals and Plants, 2 vols. Darwin The American Shepherd..... .....Morrell.
Book of Evergreens.....Hoopes. The Beauties of Tobacco.....De Coin.
Cotton Culture .....Lyman. Elementary Agriculture..... ..Norton.
Drainage for Profit and Health..... .. .. Agricultural Chemistry.....Chaplins.
Squashes.....Gregory. Farmers' Companion.....Buell.
The Grape Vine.....Mohr. Agriculture for Schools.....Blake.
American Pomology.....Warder. Liebig's Modern Agriculture.....
Small Fruit Culture.....Fuller. The Complete Farmer .....Fessenden.
Gardening for Profit.....Henderson. Farmers' Barn Book.....Clater.
Mysteries of Beekeeping.....Quinby. Prairie Farming .....Card.
Rural Architecture.....L. F. Allan. Cyclopedia ... .Doyle.
American Farm Book.....R. L. Allen. Planter's Encyclopedia.....
Diseases of Domestic Animals..... " Choice of Farm.....
American Agricultural Annual..... How to get a Farm.....
" Horticultural " ..... Floral Biography ....Charlotte Elizabeth.
" Bird Fancier..... .... Landscape Gardening .....Downing.
" Rose Culturist..... Field and Garden Vegetables of America..Burr.
" Weeds and useful Plants..... Horticulture Register, 5 vols.....

Home Gardens..... Fruit Culturist.....J. J. Thomas.
American Gardener.. .....Cobbett. Strawberry Culture..... .....Pardy.
Flower Garden..... .....Brecks. Fru t Trees.....Downing.
Rose History..... .....Parsons. Practical Fruit Culture.....Baker.
Florist Guide..... Louisa Johnson. The Cotton Plant.....Turner.
Adam, the Gardener. .....Clarke. Sorghum and its Products.....Stewart.
Parlor Garden.....Cornelia Randolph. Modern Husbandry.....Andrews.
Ladies Companion for Flower Garden..... Farm and Fireside.....Blake.
River Garden..... Humphrey. Country Rambles.....Cooper.
Landscape Garden.....Kemps. Beetro t Sugar ..... . .Brant.
American Gardener..... .....McMahon. Agricultural Chemistry.....Chaptal.
Studies from Nature ..... " " .....Liebig.
Grape Culture .. ..Allan. Analysis of Soils..... ..... "
Open Air Grape Culture .....Phin. Indian Corn.....Enfield.
The Grape Question.....Sanders. Landed Property ....David Low.
On the Grape ....Strong. The American Cottage Builder.....Bullock.
Graperies.....Woodward. Cottage Residences.....Downing.
Pear Culture.....Fields.

HISTORY.

Palfrey's New England, 3 vols..... Howison's Virginia .....
Eliet's Domestic History of the Revolution ..... Burke's Virginia, 2 vols.....
Illinois ....Ford. The Annals of Tennessee .....
Illinois in 1837 ..... Wheeler's North Carolina.....
Illinois as it is ..... Conquest of Florida.....
Ritchie's Wisconsin.. ..... The Color Guard ....Hosmer.
Washington's Co respondence, 12 vols ..... Butler in New Orleans.....Parton.
Sparks' American Correspondence. ..... American Antiquities .....
Sparks' Letters to Washington, 3 vols..... Lossing's United States..... .....
Hildreth's U. S. History, 5 vols..... ... History of America, 2 vols ....
Sims' South Carolina..... Botta's War of Independence, 3 vols.....
Ramsey's South Carolina ..... Whatson's Men and Times of the Revolution...
Burnett's Northwest.. ..... Power and Progress of the United States.....
Historical Collections of Ohio..... Americus Vespucius..... .....
Settlement of Delaware..... .... History of Pontiac's Conspiracy.....
Historical Collections of Louisiana, 5 vols..... Barber's New England .....
Buchanan's Administration ..... Manual of Modern History.....
History of New Jersey..... Martin's China, 2 vols..... .....
Connecticut Historical Collections..... Rembault's France .....
States and Territories..... Florence of Worchester Chronicles.....
Mather's Magnolia..... The Loyalist of the Revolution, 2 vols .....
Niel's Minnesota..... ..... Adolphus' England, 7 vols.....
Mississippi Bubbles..... Cradle of the Rebellion.....
Hazard's Annals of Pennsylvania..... Report of Kossuth's Reception.....
Gordon's Pennsylvania.....

BIOGRAPHY.

Irving's Life of Washington, 5 vols..... Sargent's Major Andre.....
" " Columbus, 3 vols..... Irving's Goldsmith..... .....
" " Mahomet, 2 vols..... Flander's Lives of the Chief Justices, 2 vols ..
Sparks' " Washington..... Life and Writings of J. Adams, 10 vols.....
Life of J. Q. Adams... ..... Alebone's Dictionary of Authors .....
Diary of A. Lawrence..... Dictionary of Congress .....
Parton's Life of A. Burr.....

LITERATURE, &c.

Chamber's English Literature, 2 vols..... Irving's Bracebridge Hall.....
Duyckink's American " 2 vols..... " Knickerbocker of N. Y. .....
Sismondis Literature. ..... " Woolfort's Roost..... .....
Chaucer's Poems..... .... " Miscellanies ....
Irving's Spanish Papers, 2 vols .... " Lake Trav.l'er .....
" Crayon Miscellany..... ..... " Bonneville.....

Irving's Astoria	Politics and Law.
Farnham's Prairie	Webster's Works, 6 vols
Hall's New Purchase	Curtis on the Constitution, 2 vols.
Bartlett's Americanisms	Madison's Writings, 4 vols
Language and Study	Miller's View of the English Constitution.
Science of Literature	

SCIENCE AND ARTS.

Gray's Botany	Mudy's British Birds.
Marcett's Vegetable Physiology	Balane's Philosophy, 2 vols

The superintendent of the farm furnishes the following report of the operations on the farms during the present season:

Upon looking over the farm belonging to the Industrial University, last spring, I found the fences in bad condition, being broken down, and in some instances carried away—stock of all kinds running at will over the fields.

I foresaw that it would be impossible to expect anything like success this season, with the means available for the purpose. In consequence, my first endeavor was to make the fences secure, so far as lay in my power, not by attempting too much new fencing but by removing division fences to make the enclosures next the roads as far stock proof as possible. This was the more necessary since there was so much stock running at large, ranging from sucking pigs to droves of cattle and horses, some of them, I am sorry to say, owned by persons who ought to have felt above allowing their stock to pasture in the road. I find also, from past experience, that it will be necessary to make absolute fences that cannot be torn down nor broken into, since everything that we have exposed is liable to the depredations of unscrupulous persons.

The vegetables planted upon the 40 acres south of the University have, from the weedy nature of the land and the fact that this portion, as well as the other parts of the University grounds, were entirely open to the depredations and tramping of droves of stock; while wet, together with the succeeding drought of the summer, rendered it so hard that the crops planted were almost an entire failure. One quarter acre of Carrots produced 40 bushels. Parsnips, onions, swedes, salsify, and other roots were an entire failure, so that the land was ploughed up.

This was upon the second planting, late in May, the first planting having been drowned and washed out by the continued and excessive rains of early May.

Of potatoes there were planted about three acres, which were faithfully plowed, and also hoed by hand twice; nevertheless the

yield was but 95 bushels. Of the sort planted were, Early York, Sebeg, Goodrich, White Sprout and Peach Blow. The first named gave the best yield, and the last named were the poorest, yielding but eight bushels for 1½ acres of land, while the first four named varieties, 1½ acres, yielded 87 bushels. The reason for this was, that being early varieties they attained a larger size before the drought stopped their growth, none of the kinds having improved in size since about the 1st of July. The tops, however, receiving light showers, did not succumb until about the 1st of August.

The Wilson Strawberry plants which were set out contiguous to these crops have done remarkably well, considering the land and season, but have not made many runners, although I think we may get from 10,000 to 12,000 plants for next spring without detriment to the crops. The Rhubarb was nearly killed by the season and hard baked land, and will have to be removed to better soil. The Sugar Corn gave a fair yield, but was badly depredated upon by poachers. It was planted too late to be available for market, and is stored away for seed. The Tomatoes planted made as good a growth as could be expected, but like the corn, they were stolen until they became quite plenty; the balance were sold, bringing $16 35.

The land was plowed last spring six inches deep, and has this fall been trenchplowed (with the exception of the land in corn), 12 to 14 inches, in the most thorough manner. The land previously in sweet corn has been re-plowed 8 to 10 inches deep.

Of the land rented, there was produced for the University share, by G. H. Holmes, 50 acres, 40 bushels oats, 30 bushels wheat; Witt, Riel and Kraft, 80 acres, 162 bushels corn, 9½ bushels buckwheat, 127 bushels oats; Martin Clancey, 48 acres, 386 bushels corn, 67 bushels oats; M. Schultz, 20 acres, 332 bushels corn; C. Campbell, 80 acres, 123 bushels oats, 16¾ bushels wheat, 511 bushels corn; sundry parties, 15 acres, 53 bushels oats. Total, 293 acres. Corn not all delivered.

Of this land about 50 acres are situated upon the experimental farm, and the balance, 240 acres, is upon the stock farm, and includes slough and unproductive land about 40 acres, making land actually cropped about 200 acres. Of this rented land, all that was in small grain has been re-plowed this fall—all of it 10 inches deep, as near as it could be worked; and there has been

sown and drilled (7 to 15 inches apart), the following kinds of winter wheat:—2 bushels white May wheat, donated by Prof. W. F. Bliss; 2 bushels Red Genesee wheat, donated by Messrs. Haywood & Son, of Pana, Ills.; 1 peck of Polish wheat, from Department of Agriculture; ½ bushel Talavera wheat, donated by Prairie Farmer Co., Chicago; ½ bushel Behira Egyptian Wheat, received last spring from D. M. Ferry & Co., of Detroit, Mich.

The experiment intended to be carried out in this direction is to find the relative value between sowing broadcast, drilling 7 inches and drilling 15 inches apart. The 15 inch drills are to be hoed, the sowing all being done by machine, the land all plowed alike, 10 inches deep; and I propose, as some of the varieties are thought to be tender, to cover it with mulch, if possible, this winter. I would like also, if thought advisable, to continue the same experiment with the leading varieties of spring wheat.

I have received a proposal of W. M. Mann & Co., of Gillman, that they donate us Hedge plants for one mile, and sell us what we want besides for $2 10 per mile. I have not done anything yet in preparing the Hedge rows, not knowing where the lines might be, apprehending that the committee, perhaps at this meeting, would make some modifications.

I prepared and set, last spring, 80 rods of hedge between University lands and M. Burt, in connection with himself, and the result has convinced me that it is not profitable to continue this kind of experiment, but to make our fences for ourselves alone. The opinion of the Professor of Agriculture is, that the land next year should be entirely worked by ourselves, in which I fully coincide, in consequence of the difficulty of getting the work done by tenants as well as it ought to be done. I must, however, do our tenants the justice to say that they have carried out their agreements the past season faithfully, and as well as they were able, with one exception, and acknowledge that they have worked their crops better than I have been able to do with the help at my disposal—butwith the deep plowing this fall we ought to expect to do much better next and each ensuing season. It is not to be denied that the lands belonging to the University have been badly worked heretofore, and it is simply impossible to clean them by horse power alone among crops in one season, but with proper draining, clean culture, clover and fallow crops, it will not be difficult to renovate and bring up to a high standard, such a soil as we pos-

sess. The only question to be decided is, whether it is to be done by expending a good deal of money during one or two years, or gradually by a system of rotation and turning under of green crops. My suggestion would be to keep clean at any cost, what we cultivate, use all the manure we can make or buy, sow clover liberally and turn it under from time to time.

There is now on the stock farm about 150 acres of worn-out meadow. Last spring I sowed 80 acres of Timothy seed, which came up well, but subsequently succumbed to the extreme drought, as did, indeed, all other sowings made in this neighborhood so far as has come to my knowledge.

The reason for sowing clean Timothy was from the fact, that having no stock on the place, that is to be sold, it would bring more money than if mixed with clover. The failure of the crop will oblige us to hold our old meadow another year, and what seed is to be sown next year, I think, should be largely of clover, in order to make it assist in improving the condition of the land. The advantage of sowing largely of clover, would be the pasturage obtained and the consequent manuring of the land from the droppings of the stock pastured. The second year a crop of hay might be taken, and if the land was sufficiently rich, a crop of seed after it.

The aftermath might be plowed under and wheat sown, to be followed with corn; that with small grain and reseeded; or, a crop of corn might be raised upon the sod, trenched, say 10 inches deep, to be followed with wheat or barly and reseeded, until the land was brought into a high state of fertility. A good rotation, when stock enough was kept to eat all the corn and hay, would be to divide the farm into fields for a four years' rotation, keeping one quarter of the farm in corn, one quarter in small grain, one quarter in pasture and one quarter in meadow. A six years' course would give corn, oats, corn, barley or wheat, pasture, meadow. A seven years' course might include a fallow, if necessary, but naked fallow I consider objectionable. This might be obviated by sowing and plowing under green crops, as corn, rye, buckwheat or millet. I consider oats an objectionable crop upon any land strong enough for wheat. My experience is that oats require very good soil to produce a paying crop, but it will grow on land too moist for wheat or barley. Root crops are entirely left out; if used, they must be upon a part of the land devoted to corn.

Upon moving to this place I brought with me a fine young team of horses, which I have worked upon the farm ever since. Last spring I took two plats of land containing about four acres, partly for experiment, partly to raise my own vegetables, and partly because the land in the College garden plat was in so bad a condition that I knew that nothing could be raised to advantage there. Upon this plat I planted Early York, Sebeg, Chenery, Goodrich, White Sprout, Jackson White, Titicaca and Peach Blow potatoes. The Early York and Titicaca potatoes yielded the best crop; Chenery, Goodrich and White Sprout were about alike for earliness; the Peach Blow, being late, suffered from the depredations of the black potato bug, (Cantharis Astrata, supposed). All the other potatoes suffered also more or less, early in the season, from attacks by the 10 lined potato beetle, but were principally held in check, and finally destroyed by cannibal insects, especially the lady bugs and so-called stink bugs. Among the vegetables planted were, Boston Marrow, Hubbard, Turban and Mammoth French Squash, five sorts String Beans, four sorts Parsnips, four sorts Peas, three of Carrots, two of Spinach, one of Salsify, five sorts of Melon, three sorts Sweet Corn, seven sorts of Onions, six sorts of Cabbage, five sorts Tomatoes, six sorts of Beet, and Okra, Celery, Radish, Lettuce, Egg Plant, Martynia, Pepper, Kohl Rabi, Nasturtium, and some other plants. These were kept absolutely clean, and the result was satisfactory, even for this dry season, many of the sorts, as Celery, Egg Plant and Okra being extremely good for any season or climate.

Sixty-one of the varieties were shown at the Champaign County Fair, receiving, as a whole, a complimentary premium, besides notices upon specialities. They were not placed there for competition, as it was not considered advisable to compete with private collections.

I have thought that under the circumstances, it would not be asking too much of the Trustees to allow the use of my team to offset the land used.

Wheat blossomed June 13th; potatoes, beets, carrots, turnips and early peas were fit for the table the same day. On the 20th, Champion of England peas were picked; on the 23d, string beans and cucumbers; 25th, Eureka tomatoes; 26th, Keyes' early tomatoes; July 9th, Tilden tomatoes; 11th, sweet corn; 12th, egg plant; 22d, wheat ripe; 25th, oats ripe; September 11th,

Burlington corn, planted June 13th, was fully matured for cutting up.

JONATHAN PERIAM, *Head Farmer.*

APPROPRIATIONS.

The chief question which should engage the attention of the Board at the present meeting, is the propriety of asking an appropriation from the State Legislature at its coming session. It has become more and more obvious that the best interests, if not the first success of the University, will demand prompt and sufficient State aid, and it is hoped both that the great interest of the present and coming generations here involved, and the almost uniform example of sister States, will incline the Legislature to extend to this institution the aid it needs. It is certain that the agricultural operations planned here, and expected by the Legislature and the people to be carried out, cannot be sustained by the funds of the University without seriously cripping its proper work of instruction. But the failure to carry out the agricultural experiments, or even any considerable delay in effecting a full organization of the experimental farms and gardens, would create public distrust and rob the University of that public confidence essential to its success. The amount of these appropriations required will be laid before you at some suitable hour, to be appointed by you, for their discussion.

J. M. GREGORY, *Regent.*

On motion of Mr. Cunningham, the reading of the minutes of the last meeting of the Board of Trustees was dispensed with, those minutes being already in print.

The minutes of the Executive Committee were read for information, and the committee instructed to correct the minutes by inserting the following items omitted by mistake, viz: the order for a carpenter shop and tool house, and the order for the purchase of surveying instruments.

The usual oath as trustee was administered to M. Brown, of Chicago.

The Regent, as chairman of the committee on Faculty, reported that the committee had employed A. P. S. Stuart as Professor of

Chemistry. Thos. J. Burrill as Assistant Professor of Natural History and Botany, Col. S. W. Shattuck as Assistant Professor of Mathematics and Instructor in Military Tactics, and Capt. E. Snyder as Bookkeeper and Instructor in Bookkeeping, and now recommend these gentlemen for permanent appointment to these several places. The Regent further stated, that Capt. Snyder had been employed during the term in teaching German, and recommended that he be appointed to an Assistant Professorship, to be hereafter named.

The Board, on motion, proceeded to consider the nominations made by the committee on Faculty and Course of Study, and on motion of I. S. Mahan, it was voted—"That Professor A. P. S. Stuart be and is hereby elected to the chair of Chemistry, at a salary of two thousand (2000) dollars per annum, to take effect from and after September 1, 1858; that Thomas J. Burrill be elected Assistant Professor of Natural History, at a salary of twelve hundred (1200) dollars per annum, for the term of one year from the 1st day of September, A. D. 1868.

Resolved, That Col. S. W. Shattuck be elected Assistant Professor of Mathematics and Instructor in Military Tactics, at a salary of twelve hundred (1200) dollars per annum, for one year from September 1st, A. D. 1868.

The Regent asked that Captain Snyder be appointed Assistant Professor without assigning his place, at a salary of twelve hundred (1200) dollars per annum. Whereupon on motion of Mr. Cunningham, he was so appointed, his appointment to take place from and after this date.

Mr. Hayes, of Chicago, asked leave to read a communication from the Common Council of Chicago, in relation to the Polytechnic School in Chicago; which being granted, he proceeded to read as follows:

STATE OF ILLINOIS,
COOK COUNTY,
CITY OF CHICAGO.

I, A. H. Bodman, Clerk of the City of Chicago, do hereby certify that the following proceedings were had in the Common Council of said city, at a regular meeting held August 3d, 1868, to-wit:

Ald. Holden, of Committee on Finance, to whom had been referred several petitions in relation to the location of the Mechanical department of the Illinois Industrial University, and asking that the Common Council appropriate a certain amount of money therefor, submitted a report recommending the adoption of a preamble and resolution attached thereto.

—**6

Ald Macalister moved that the report and resolution be laid over and published.

Carried.

The report and resolution are as follows:

To the Hon. the Mayor and Aldermen of the City of Chicago, in Common Council assembled:

Your Committee on Finance, to whom was reforred a communication, with preamble and resolution, from Hon. S. S. Hayes, Trustee Mechanical Department State Industrial University, as also communication from S. S. Hayes, J. C. Burroughs, J. M. Van Osdell, E. L. Brown, and D. S. Hammond, Committee of the Trustees of the Mechanical Department of the Illinois Industrial University; also seventeen petitions from citizens of Chicago—all of which ask this Council to favorably consider their application to have the Polytechnic College or Mechanical department of the State Industrial University, located in the city of Chicago, with an appropriation of $250,000, by a contribution to the same, having carefully considered the subject, report that your Committee fully indorse the views as set forth in the preamble and resolution referred to them.

Your Committee believe that the interests of the mechanics of the Northwest, of which Chicago is the commercial center, demand an institution of this kind for the better development of the arts and sciences in our midst, and believing this, we think it the duty of this Council, as the legislative body of the City of Chicago, to lend its aid in the manner sought, and we would respectfully ask the concurrence of this Council in the following preamble, and the passage of the resolution herewith.

WHEREAS, The establishment and successful operation in the city of Chicago of a Mechanical or Polytechnic College, for the more thorough education of mechanics in those sciences which are necessary for the attainment of the highest skill in the mechanical arts, would be of great value to the industrial class in the city of Chicago, and to the State at large, and

WHEREAS, Under the acts of Congress, and the General Assembly of the State, the Board of Trustees of the State Industrial University have designated Chicago as the place for the location of the Mechanical or Polytechnic department of that University, subject to the condition that the same be located as near the center of the city as possible; and

WHEREAS, The county of Champaign has donated to the Agricultural department of said University, county bonds of said county to the amount of $100,000, and other property to the estimated value of $350,000 more, in consideration of the location of said Agricultural Department in said county; and

WHEREAS, There seems to be a defect of power under the city charter for the city to issue bonds for such a purpose at this time, therefore, be it

Resolved, by the Mayor and Aldermen of the City of Chicago, in Common Council assembled, That the following proposition be and the same is hereby made to the Board of Trustees of the Mechanical or Polytechnic department of the State Industrial University, to-wit: If and upon condition that the Trustees of said Mechanical department shall permanently locate said de-

partment and its buildings at a site within one-half mile of the geographical centre of the city of Chicago, the Common Council will, and hereby pledges itself, to make application to the General Assembly of the State, at its next regular session, for power to issue seven per cent. bonds of the said city to the amount of $250,000, as an endowment for said Mechanical department, and, upon obtaining such power, will, within ninety days thereafter, issue and deliver to the Trustees of said Mechanical or Polytechnic department for the purpose aforesaid, the said amount of $250,000 of seven per cent. bonds of the city of Chicago.

All of which is respectfully submitted.

CHARLES C. P. HOLDEN,
CHARLES G. WICKER,
THEODORE SCHINTZ,
Committee on Finance.

I do further certify that at the regular meeting of said Common Council, held in Chicago August 10th, A. D. 1868, the following proceedings were had, to-wit:

Report of Committee on Finance on petitions and resolutions in relation to Illinois Industrial University, laid over and published Aug. 3, 1868.

Ald. Holden moved to concur in the report and pass the resolution.

Ald. S. I. Russell moved to postpone action until next regular meeting, and demanded the ayes and noes thereon.

The motion was lost by the following vote:

Ayes—Knickerbocker, Calkins, Macalister, S. I. Russell, B. F. Russell, Casselman, Buehler, Beebe, Schmidt, Berger, Herting—11.

Noes—Cox, Donnellan, Wicker, Hahn, McRoy, Raber, Sheridan, Walsh, Keeley, Hildreth, Comiskey, Rafferty, Carpenter, Salisbury, Holden—15.

The question then being on the motion of Ald. Holden, the ayes and noes were called, and the report was concurred in, and the resolution adopted by the following vote:

Ayes—Knickerbocker, Cox, Dixon, Donnellan, Wicker, Hahn, McRoy, Calkins, Raber, Sheridan, Walsh, Keeley, Macalister, Hildreth, Comiskey, Rafferty, Carpenter, Salisbury, Holden, Buehler, Beebe, Schmidt, Berger, Herting—24.

Noes—S. I. Russell, B. F. Russell, Casselman—3.

The following is the resolution as passed:

WHEREAS, The establishment and successful operation in the city of Chicago, of a Mechanical or Polytechnic College for the more thorough education of mechanics in those sciences which are necessary for the attainment of the highest skill in the mechanical arts, would be of great value to the industrial classes, to the city of Chicago, and to the State at large, and

WHEREAS, Under the acts of Congress, and the General Assembly of this State, the Board of Trustees of the State Industrial University have designated Chicago as the place for the location of the Mechanical or Polytechnic department of that University, subject to the condition that the same be located as near the center of the city as possible; and

WHEREAS, The county of Champaign has donated to the Agricultura

department of said University, county bonds of said county to the amount of $100,000, and other property to the estimated value of $350,000 more, in consideration of the location of said Agricultural department in said county, and

WHEREAS, There seems to be a defect of power under the city charter for the city to issue bonds for such a purpose at this time, therefore, be it

Resolved, By the Mayor and Aldermen of the city of Chicago in Common Council assembled, that the following proposition be, and the same is hereby made to the Board of Trustees of the Mechanical or Polytechnic department of the State Industrial University, to-wit: If, and upon condition that the Trustees of said Mechanical department shall permanently locate said department and its buildings at a site within one-half mile of the geographical centre of the city of Chicago, the Common Council will, and hereby pledges itself, to make application to the General Assembly of this State, at its next regular session, for power to issue seven per cent. bonds of the said city, to the amount of $250,000, as an endowment for said Mechanical department, and, upon obtaining such power, will, within ninety days thereafter, issue and deliver to the Trustees of said Mechanical or Polytechnic department for the purpose aforesaid, the said amount of $250,000 of seven per cent. bonds of the city of Chicago.

And that said resolution was duly approved by the Mayor of said city, and remains in full force.

[SEAL.] In testimony whereof, I have hereunto set my hand and the seal of said city, this 17th day of November, A. D. 1868.

A. H. BODMAN, *Clerk*.

Mr. Flagg asked and obtained leave to read a resolution relating to experiments to be carried out upon the University farm, and simultaneously in different parts of the State, and that the Regent be authorized to draw a warrant to meet the expenses of the same, unless the Legislature shall make up appropriations for the same; and also a resolution, that the Executive committee provide for a course of lectures and discussions, to commence about the 12th of January next, to continue two weeks; that the co-operation of the practical farmers of the State be earnestly solicited to make the discussion successful, and disseminating the views in practical and scientific agriculture and in facts relating thereto.

Laid on the table.

On motion, a recess was taken until 12 o'clock, to enable the committee on Polytechnic branch to report. Upon re-assembling at 12 o'clock, the committee on Polytechnic School reported as follows:

REPORT OF COMMITTEE.

Your special committee to whom was referred the resolution of the city of Chicago, proposing the donation of $350,000 to the Mechanical department of this institution, located at Chicago, and the resolution of Mr. Hayes in relation thereto, would report that we recommend the adoption of the resolution in the following form:

Resolved, That this Board appreciate highly the liberal proposition of the city of Chicago, by its resolution of August 11th, 1868, to appropriate $250,000 of seven per cent. bonds of said city, as soon as the requisite power can be obtained, as an endowment for the Mechanical Department of this University, upon condition that the said department and its buildings should be permanently located at a site within one-half mile of the geographical center of said city.

Resolved, That in accordance with the resolution of this Board of March 13th, 1867, establishing a Mechanical Department of the Industrial University at Chicago, as near as possible to the center of the city, the members of this Board residing in the Third Grand Division and First Congressional District be, and they are hereby, instructed to accept said proposition, and notify the said city thereof; and they are authorized and instructed to execute and deliver such contracts as may be necessary or proper in the premises.

(Signed) I. S. MAHAN,
Chairman of Committee.

Mr. Hayes moved its adoption, which being seconded, the ayes and noes were called, resulting as follows:

Ayes—Allen, Blackburn, Brown of Chicago, Brown of Pulaski, Cobb, Burchard, Edwards, Flagg, Goltra, Hayes, Johnson, Mahan, McMurray, Pickrell, Pullen, Quick, Scroggs, Van Osdell, the Regent—19.

Noes—None.

The subject of Legislative appropriation was then called up. Mr. Johnson moved that this subject be made the special order for 7 o'clock, and that it be discussed in secret session. After some discussion, on motion of Mr. Flagg, it was referred to the Finance Committee. Carried.

On motion the Board adjourned to 2 o'clock, P. M.

AFTERNOON SESSION.

The Board was called to order at 2:30 P. M.

The following resolutions of Mr. Flagg were taken up and passed:

Resolved, That the Superintendent of the Farm be instructed to report a scheme of Agricultural experiments for the year 1869, to be carried out on the University farm, and also simultaneously at other points in the State, em-

bracing as great a variety of soil and climate as possible; said report to be made to the Board at this meeting if practicable, or if otherwise, to the Executive committee at its next meeting.

Resolved, That said scheme of Agricultural experiments, when revised, corrected and approved by this Board, or the Executive committee, shall be carried out by the Superintendent of the farm and the Corresponding Secretary under the direction of the Regent, and that the Regent be authorized to draw a warrant, or warrants, not to exceed the sum of $500, to meet such expenses as may be incurred in procuring material for, and carrying out these experiments, unless the Legislature shall, at the next session, make an appropriation for that purpose.

Also the following:

Resolved, That the Executive committee be instructed to provide for a course of Agricultural lectures and discussions, to commence about the 12th of January next and continue two weeks, these discussions to be held at the University and free to all persons—and that the attendance and co-operation of the practical farmers of this State is hereby earnestly solicited to aid in making these discussions successful, both in disseminating their views on the best methods of practical farming and in furnishing facts for a science of agriculture.

Carried.

The Committee on Horticulture reported plans and specifications for improvements of horticultural grounds and experimental planting, which, on motion, were referred to the Finance committee.

To the Board of Trustees of the Illinois Industrial University:

The committee on Horticulture respectfully beg leave to report.

Section seven of the Act of Incorporation, among other things, authorizes the Board of Trustees to "establish and provide for the management of said model farms as may be required to teach, in the most thorough manner, such branches of learning as are related to agriculture and the mechanic arts."

As a part of such model farm, and for the more perfect demonstration of that department of agriculture known as horticulture or garden culture, we beg leave to make the following recommendations:

The plat hereunto attached as a part of this report, marked A, exhibits the ground plan of the grounds proposed to be occupied, and the schedule shows how they may be planted, and also contains the list of forest trees recommended for trial.

No extended argument is required at this time to prove the need of teaching the cultivators of the soil the importance of forest tree planting, of orcharding, and of other departments of gardening.

In regard to the orchard proper, the most important feature that we now recommend, is the procuring and planting of samples of all the improved varieties of fruits for identification and for comparison—a sort of fruit tree museum of varieties, that will be at all times accessible for reference.

The management of the orchard, vineyard and garden will more properly come under the care of the Professor of Horticulture, or head gardener. But we would urge that the grounds reserved for the orchard, be occupied for that purpose at as early a day as possible. The estimate for the cost of trees will be found in the schedule, but that for labor and other material are combined in the ground plan, and its proportion, to some extent, must be left to the discretion of the person in charge of the improvements.

The great feature of these grounds, and what is of paramount importance at this time, to the whole people of the State, is the planting of forest trees for useful purposes. It is a new demand upon their industry and upon their lands, from which they cannot fail to reap the most valuable results.

The new condition of things, created by railroads and improved agricultural implements, present new industries, both to the cultivators of the soil and to the mechanic, in which they have a mutual interest. The forests are rapidly disappearing, or at least those useful trees that have a commercial value, and yet many of the new demands have not been met, nor is the old supply likely to hold out. But, if the forests of Michigan, Wisconsin, Minnesota and Indiana were adequate to the demand, as a matter of economy in freights, if not in the superior quality of our second growth timber, especially of the decideous varieties, it is an object to grow them at home, rather than to buy them.

Timber for railroad ties, culverts, cars, roadways and buildings, fencing, vineyard stakes, hop poles, stanchions for coal banks, soft wood, like white willow and the poplars, for berry boxes, crates and staves; hoop poles, wagon and carriage material, agricultural implements, and the multiform wants of the age, make up a demand of most surprising magnitude, that will add to our rural industry an importance that the most sanguine have not hitherto dreamed of.

If we look at this as simply the demand of agriculture, it must be conceded that it is legitimate and ought to be granted without an objection; but we have added to this the claim of the mechanic, who is also largely interested, for it will enable him to compete with those of other States in the supply that commerce demands.

The State that sells the raw products of its soil is never rich, while the States that manufacture for others do well; those that grow the raw material and manufacture it at home, are the most prosperous. No doubt the State of Illinois had these facts in view when it established this great school of the industries for the especial benefit of those two classes who create the wealth of the State.

There are in this State about eighty species of forest trees, besides the larger shrubs. With the exception of the oaks, yellow poplar and hickory, we have not drawn largely from our native forests; and to-day we purchase nearly all of our timber. Nearly all of the ash timber used for agricultural implements, a part of our fence posts, and a portion of our railroad ties come from other States. Added to these is the greater part of the material for our wagons and carriages, when not wholly manufactured in other States; timber

for railroad cars, and hard-wood lumber for many other useful purposes, that ought to be grown near the place of manufacture.

To bring these useful trees within the bounds of culture and to utilize them, is one of the objects of this industrial institution. To teach the people of the State how to add these products of the forest to their other crops, and thus add millions of dollars annually to the wealth of the State, to give labor a wider range and a more comprehensive field for its employment, are objects worthy of such an institution.

Thousands of acres of timber can be planted in shelter belts, to check the winds that comes down from the north, with its polar cold, destroying the plants that the genial summer, fanned with the breath of the tropics, has made to flourish on our open plains. Wall in these prairies of central and northern Illinois with belts of conifers and decideous trees and we shall have one of the best of climates; genial and equable, and with the best soil in the Union, with a geographical position midway between the two oceans, over which must pass a large part of the commerce of the world, and if we are not laggards in the world's progress we may reap from such surroundings a rich reward.

The Committee have divided these thirty species of useful forest trees into three classes, according to their supposed value for the demands of commerce and for domestic use. In the first class they include the European Larch, Austrian Pine and Norway Spruce, native trees of Europe, and the Osage Orange, native of the Southwestern States. In the second and third class, White Willow, a native of Europe; Black Spruce and Norway Pine, natives of the more Northern States. Thus making up the list with four European, three of other States and twenty-three species from the forests of Illinois.

Our other native trees of minor importance will find a place in the arboretum, where those of other sections of this Continent and of Europe may be tested side by side. It is probable that among them may be found many of value.

The ten acres reserved for a commercial garden and grounds—for the testing of new varieties of plants—for comparing and further testing of old ones—for the proving of new modes of culture and the testing of new implements, cannot fail of proving useful, especially to those students who remain at the University during the spring and summer occupied in some "industrial avocation." As the larger part of this plot of ground will be devoted to a market garden it is hoped that it will prove to be a paying investment.

We recommend the planting of an osage hedge around the two hundred acres embraced in the plat.

We recommend that so much of lot Y as is suitable for the purpose be planted to an experimental orchard of the apple; two trees of each variety; the rows to run North and South, twenty-four feet wide, and the trees twenty-five in the rows; the trees in each tenth row to consist of Norway spruce. In this connection we also recommend that the offer of A. M. Lawver

for duplicates of his collection of varieties, be accepted, and the proper order drawn for the amount.

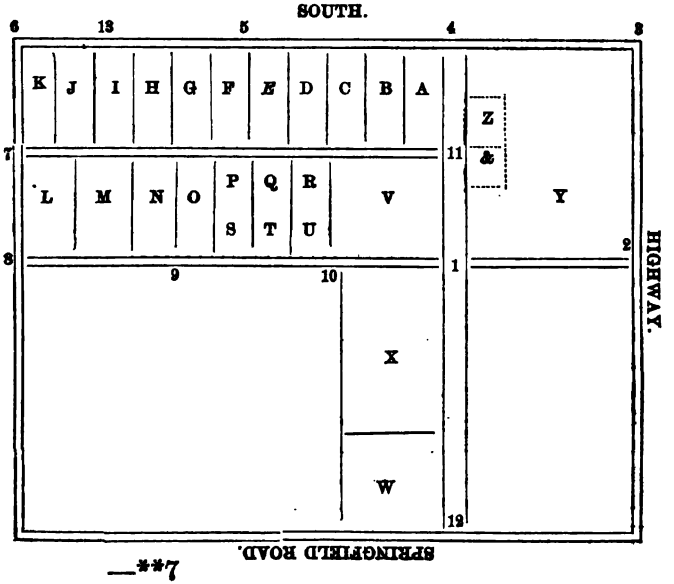
We also recommend that there be an additional experimental orchard of twenty acres, to be located on the stock farm, (Busy farm), for the testing of varieties of the peach, pear, plum, cherry, quince, apricot, nectarine—two trees of each variety, to be planted in rows sixteen by sixteen feet, with every tenth row running North and South to be planted with Norway spruce. Pears to be both standard and dwarf; one half of the dwarf pears to be planted eight feet in the row, thus: 8 by 16 feet. The relative value of standard quince stock to be tested with same varieties, both as regards market value and quality. Cherries to be tried on Morello, Mazzard and Mahaleb stocks. The whole to be surrounded with a double row of Norway spruce, set eight feet apart. The site selected to be the highest point, or points, best adapted to the purpose.

Also, one acre of vineyard, two plants of a variety, and so planted as to test the relative value of different modes of training and pruning.

Also, that lot B of the plat, containing one acre, be devoted to the testing of new varieties of the small fruits. It is probable that at some future time it may be found advisable to extend the plantation of small fruits for market, for the purpose of giving employment to those students who may, in accordance with the law, desire to remain in the University.

We also recommend the formation of an arboretum, to be located North of the new street that is located East and West on the forty acre tract, to contain about ten acres, and marked on the plat "W." So far as practicable to make the same ornamental, on the ground plan of a park, for the use of the University, and the citizens of Urbana and Champaign.

PLAT A.—SCHEDULE.



Shelter belt of two rows of trees, the one sixteen feet inside of the hedge and the other eight feet therefrom, and trees eight feet in the rows, as follows:

From 1 to 2, 80 rods European Larch.
" 2 " 3, 108 " Norway Spruce.
" 3 " 4, 80 " White Ash.
" 4 " 5, 80 " Austrian Pine.
" 5 " 18, 40 " Silver Maple.
" 18 " 6, 40 " White Pine.
" 6 " 7, 60 " Arborvitæ.
" 7 " 8, 48 " Green Ash.
" 8 " 9, 60 " Red Cedar.
" 9 " 10, 60 " Blue Ash.

Avenue 1 " 4, 80 feet wide.
" 7 " 10, 66 feet wide, and may be slightly curved.

Alley west of "A" 33 feet wide.
Alley west of belt 33 feet wide.
Alley A to J 24 feet.
Alley between ——— 24 feet.
Half of street 6 to 8, 33 feet.
Lots A to J each 188 feet wide ——
" A to J each 908 feet long.
" L, M, N, O, each 260 feet wide.
" L, M, N, O, each 669 feet long.
" P, S, Q, T, each 260 feet wide.
" P, S, Q, T, each 335 feet long.
" U, R, each 128 feet wide.
" U, R, each 335 feet long.
Lot V, 10 17–100 acres, 669x662 feet.
" X, about 26 acres, excluding streets.
" W, arboretum, about ten acres.
" Y, enclosure for apples, about 43 acres.
" Z, one acre for gardener's residence.
" &, two acres for Superintendent's house and outbuildings.
Avenue 1 to 12, 80 feet.

USEFUL TREES—FIRST CLASS.

		Estimated Cost.
Lot A, 4 acres	European Larch,	$108.80
" B, 4 "	Osage Orange	21.76
" C, 4 "	White Pine	133.20
" D, 4 "	White Ash	65.20
" E, 4 "	Austrian Pine	133.20
" F, 4 "	Green Ash	65.20
" G, 4 "	Arborvitæ	326.40
" H, 4 "	Blue Ash	65.20
" I, 4 "	Red Cedar,	54.40
" J, 4 "	Norway Spruce	133.20
40 acres.		$1,106.56

SECOND CLASS.

Lot K,	2 acres	White Sugar Maple	$27.20
" "	2 "	Black Sugar Maple	27.20
" L,	2 "	American Chestnut (10 bushels nuts)	100.00
" "	2 "	Shellbark Hickory—nuts	15.00
" N,	2 "	Cucumber	54.40
" "	2 "	Norway Pine	326.40
" O,	2 "	Silver Leaf Maple	27.20
" "	2 "	Tulip	43.52
" M,	2 "	White Willow	10.88
" "	2 "	Black Walnut	10.00
	20 acres.		$1,748.36

THIRD CLASS.

Lot P,	1 acre	Red Maple	$13.60
" "	1 "	White Elm	21.76
" Q,	1 "	Red Elm	21.76
" "	1 "	Butternut (nuts)	10.00
" R,	1 "	Catalpa	5.00
" S,	1 "	Hemlock	40.80
" "	1 "	Basswood	27.20
" T,	1 "	White Oak	10.00
" "	1 "	Black Spruce	40.80
" K,	1 "	(South end) Burr Oak	10.00
	10 acres.		$1,949.28

The White Pine, Austrian Pine, Norway Spruce and Hemlock to be planted 8 by 8 feet; all others 4 by 4 feet. The former requiring 680 trees to the acre, and the latter 2,720. The above distances to be varied to some extent by way of experiment, to ascertain, by actual trial, the most proper distances for the planting of the several species.

ESTIMATE OF FUNDS REQUIRED.

Trees, Nuts and Seeds for Forest Grounds	$2,000
" for Orchard (4,000)	1,200
" " Belts	500
" " Orchard on the Stock Farm	2,000
Hedge Plants	18
House for Superintendent	3,000
" " Gardener	500
Barn and Out-buildings	2,000
Farm and Repairs	500
Two Span of Horses	600
Two Wagons and Harness	282
Team hire, Subsoiling or Trench plowing	300
Tile Draining	2,000
Labor, 2 years	7,100
Total	$22,000

We would recommend that the Legislature of the State be asked to make an appropriation of eleven thousand dollars a year, for two years, for the above purpose.

B. PULLEN,
S. EDWARDS,
O. B. GALUSHA,
M. D. DUNLAP,
W. C. FLAGG.

Dr. W. Kile, of Paris, Edgar county, having been appointed by the Governor to the place made vacant by the death of Mr. Geo. Harding, appeared in his seat, and the usual oath was administered to him by Judge Cunningham.

The treasurer, J. W. Bunn, read statement of sale of scrip, and the manner in which the funds have been invested. Referred to committee on Finance.

On motion of Mr. Burchard, the account of balance left in the hands of the Regent was referred to the auditing committee, and he further moved that all of the accounts be referred to the same committee.

The following resolution was then offered:

Resolved, That the committee on Library be instructed to obtain a policy or policies of insurance on the library, instruments, apparatus in the University building, and on all farming implements, and on the buildings in which said implements are housed or stored—to be insured at the full value, or as near thereto as practicable; and the amount sufficient to pay such premiums as may be required is hereby appropriated, and the Regent is instructed to draw a warrant for the same.

Carried.

Mr. Edwards presented the following resolution:

Resolved, That we recognize it as a duty of the Board of Trustee to make this University pre-eminently a practical school of Agriculture and the Mechanic arts.

After discussion, Mr. Cunningham moved to amend, by adding after "arts" the following words, "not excluding other scientifical and classical studies." Pending the discussion which followed, the Regent announced that the students were assembled in the Chapel, and a recess was taken to enable the Trustees to inspect them.

Upon re-assembling, after further discussion, the yeas and nays being called, it was passed as amended by the following vote:

Yeas—Allen, Blackburn, Brown of Chicago, Brown of Pulaski,

Burchard, Cobb, Cunningham, Dunlap, Edwards, Flagg, Galusha, Goltra, Hayes, Johnson, Kile, Lawrence, Mahan, Pickrell, Pullen, Quick, Scroggs, Van Osdell, and the Regent—23.

Nays—McMurray.

Upon motion of J. M. Pickrell it was voted: That the foregoing resolution be furnished to the agricultural and other presses of the State, with request for its publication. A motion to adjourn until 7 o'clock, P. M. prevailed.

EVENING SESSION.

Board called to order at 7 o'clock.

On motion of Mr. Blackburn, it was voted to dispense with the ruling of the morning to debate with closed doors. The report of the Committee of Agriculture was then read, and upon motion, it was referred to the committee on finances.

To the Board of Trustees Illinois Industrial University:

The committee on Agriculture make the following report for your consideration.

1st. That the Stock farm is in such condition as to require for the cultivation of the lands, protection of the crops, repair of building and fences thereon, the sum of three thousand ($3,000) dollars, to be expended as follows:

For the purchase of two teams	$ 800 00
" " of harness	75 00
" " of one wagon	125 00
To be expended in repairing fence	1,000 00
For hedging Stock farm	100 00
Repairing house, barn, and for well and cisterns	1,000 00
	$3,000 00
And in addition, as a contingent fund to meet such necessary expenditures not herein enumerated, but as may be called for,	$2,000 00
	$5,000 00

Your committee likewise recommend, as soon as the finances of the Institution will admit, or can be augmented, that the following amounts be set apart to be expended on said farm:

1. $5,000 for barn and tool house on experimental farm.
2. $5,000 for stock and sheep barn, pens, hennery, pigery, apiary, &c.
3. $5,500, houses for farm laborers and gardners.
4. $5,000 for fencing.

5. $2,500 for tools for farm and garden.
6. $5,000 for stock, neat cattle, sheep, swine, etc.
7. $8,000 for underdraining experimental farm and gardens, 200 acres, at $40 per acre.
8. $2,000 for roads, gates, bridges, etc.

Making in the aggregate, $38,000.

All of which is respectfully submitted.

THOMAS QUICK,
Chairman Agricultural Committee.

The report of the Committee on Mechanical Department was then read, and, on motion, so much of it as relates to estimates was referred to the Finance committee.

REPORT.

The committee on Mechanical Department would respectfully report:

That in their opinion it has become necessary that there should be erected a building for the reception of machinery, for the repair of machinery, and other mechanical work; also, for Art Gallery, etc., etc. Your committee herewith present, a sketch plan, embodying somewhat their ideas; also they herewith present an approximate estimate from Mr. Searfoss, the present carpenter of the University, giving the probable cost of the building without any engine, shafting, etc., at the sum of $26,000. But your committee would state that, in their opinion, this estimate is too low by $10,000 at least, and would, therefore, give their estimate for said building at $40,000.

J. W. SCROGGS,
Chairman of Mechanical Committee.

On motion, Dr. W. Kile, of Edgar county, was appointed to the place in the standing committee formerly occupied by Col. George Harding, deceased.

The following resolution was offered by Mr. Johnson:

Resolved, By this Board, that the future good of this University requires that we look forward to the removal of the present University buildings to the Busey farm, and that all improvements now made be in conformity thereto.

Motion to lay on the table prevailed.

Mr. Johnson offered the following resolution:

Resolved, That female students be admitted to the benefits of this University upon the same terms and requirements as male students, except the requisitions for military study and drill.

After discussion, Mr. Flagg offered the following substitute:

Resolved, That from and after the commencement of the Fall term of 1869, female students shall be admitted to the lecture and recitation rooms of the University.

On motion, the substitute was laid on the table. Mr. Quick

moved a reconsideration. Carried. Question: Shall the substitute lie on the table? Voted nay.

On motion, the whole matter was referred to full Board at their annual meeting. The ayes and nays being called for, resulted as follows: Ayes—Allen, Blackburn, Brown of Pulaski, Brown of Chicago, Burchard, Cobb, Goltra, Kile, Lawrence, Mahan, Pullen, the Regent—12. Nays—Dunlap, Edwards, Flagg, Cunningham, Galusha, Lawrence, McMurray, Pickrell, Quick, Scroggs, VanOsdel—11.

A. M. Brown offered the following resolution:

Resolved, That a committee of three, of which the Regent shall be Chairman, be appointed, whose duty it shall be to prepare an address to the Legislature setting forth fully and in detail the plans of the Board for the improvement of the lands of the University, and the increase of its facilities for teaching, the importance of carrying out these plans and the necessity for aid from the State in carrying them out, with estimates of the amounts required.

Adopted.

The Auditing Committee, to whom was referred the Treasurer's Report, have examined the same and compared his vouchers with his accounts, and find the same entirely correct; that he has exhibited warrants drawn by the Regent, numbered 16, 34, 58, 105, 145, 151, 153, of old numbers, and of No. 1 to 278, inclusive, except No. 113, of 2nd series, and we recommend that the Treasurer be ordered to cancel said warrants so paid by him, and hold the same.

L. W. LAWRENCE,
A. M. BROWN,
H. C. BURCHARD,
SAMUEL EDWARDS,
O. B. GALUSHA,
Auditing Committee.

The following resolution, offered by H. C. Burchard, was then adopted:

Resolved, That the Treasurer, under the direction of the Chairman of the Finance Committee, be authorized to invest in the bonds of Counties of this State drawing ten per cent. interest, whenever the same can be safely done, a portion of the land scrip funds now temporarily invested in Illinois six per cent. bonds.

Also the following:

Resolved, That the Treasurer be authorized to pay the taxes on the lands located by the University, and that the Regent issue warrants in his favor for such sum as may be necessary.

Carried.

On motion of Mr. Edwards, the Chairman of the Auditing Com-

mittee was requested to look over the accounts and report to the Executive Committee.

On motion of Judge Brown it was—

Resolved, That the Regent be authorized to secure from Mr. Lawver the apple trees referred to in the report of the Horticultural Committee, upon the best terms, as to price and time of payment, that he can obtain.

Amendment by Mr. Galusha, that Judge Brown be substituted for the Regent.

Amendment agreed to.

The following preamble and resolution by Mr. Blackburn, relating to the decease of Colonel George Harding, was then presented:

WHEREAS, This Board, with deep felt sorrow, has learned since its last meeting of the death of Colonel George Harding, one of its most faithful and efficient members, and an earnest and devoted friend of industrial education.

Resolved, That we express our heartfelt sympathy with the bereaved family and friends in this irreparable loss.

Resolved, That a copy of the above resolution be forwarded by the Recording Secretary to the widow and family of the late Colonel Harding, and that it be entered upon the minutes of this Board.

It was voted that it be so done.

The Finance Committee then reported back the report of Treasurer on sales of scrip, which was accepted.

Report of sale of the Agricultural College scrip, sold for account of the Illinois Industrial University:

96,160	acres	sold	at	56 5–16	per	acre	.....		$54,150.10
48,000	"	"	"	56 1–2	"	"	.....		27,120.00
32,000	"	"	"	56 7–8	"	"	.....		18,200,00
1,280	"	"	"	58 cents	"	"	.....		742.40
1,280	"	"	"	60	"	"	"	.....	768.00
960	"	"	"	61	"	"	"	.....	585.60
320	"	"	"	62	"	"	"	.....	198.40
180,000	acres	sold	for	.....					$101,764.50

35,520	acres	sold	at	$93.18¾	per	160	acres	.....	$20,687.61
32,000	"	"	"	93.87½	"	"	"	.....	18,675 00
16,000	"	"	"	93.50	"	"	"	.....	9,350.00
1,120	"	"	"	93.60	"	"	"	.....	655.20
8,000	"	"	"	94.10	"	"	"	.....	4,705.00
2,560	"	"	"	94.00	"	"	"	.....	1,504.00
640	"	"	"	94.40	"	"	"	.....	377.60
4,000	"	"	"	95.10	"	"	"	.....	2,377.50
160	"	"	"	96.00	"	"	"	.....	96.00
100,000	acres	sold	for	.....					$58,427.91
100,000	acres	sold	for	.....					90,000.00

RECAPITULATION.

180,000	acres sold for	$101,764.50
100,000	" " "	58,427.91
100,000	" " "	90,000.00
	Total	$250,192.41
	Invested as follows:	
40,000	Champaign Co. bonds, 10 per cent., int. payable annually May 1st	$40,000.00
50,000	Sangamon Co. 9 per cent., int. payable semi-annually, 1st of April and 1st of October	50,000.00
25,000	Morgan Co. bonds, 10 per cent., int. payable annually, June 15th	25,000.00
25,000	Chicago city 7 per cent. water bonds, int. payable semi-annually, July and January	24,961.80
109,000	Illinois 6 per cent. bonds—cost par and interest	110,153.34
	Invested	$250,115.14
	Balance for scrip on hand	77.27
	Total	$250,192.41

SPRINGFIELD, November 17th, 1868.

JOHN W. BUNN, *Treasurer.*

REPORT OF FINANCE COMMITTEE.

To the Board of Trustees Illinois Industrial University:

The Finance Committee would submit the following suggestions:

Our March estimates for the receipts of the current year, together with money then in the hands of the Treasurer, amount to $38,373 10. Our estimates of expenses for same time amounted to $28,295 10. Upon looking over the Treasurer's report, we find that $26,000 has already been used, leaving only 2,0 for the next four months, appropriated. As the various committees have not reported what they will probably need for their departments for the balance of the year, we cannot ask, at this meeting, for any further appropriations. The current salaries, however, amount to about $1500 per month. The Treasurer reports amount on hand at this time at about $6000, which would cover this expense, leaving the January interest and other receipts, which he estimates at 5,000, to pay any other expense that may be ordered by this Board or the Executive committee between now and the March meeting.

The Executive committee ordered the sale of 50,000 acres of land scrip, at $1 10. We have not been able to sell at these figures. This committee would ask further instructions from the full Board in regard to this matter.

The 25,000 acres of scrip authorized to be located, has, as yet, not been effected. This committee would recommend that the Treasurer and Mr. Goltra be authorized to make such locations.

Also that said Treasurer be authorized to get up a set of scrip and land books, with appropriate headings; scrip book to contain statement of scrip sold, to whom, price, number, etc., scrip located, and by whom, State, subdivision, etc. Land book to contain full description of all land located, State, township, range, etc., with such remarks as the persons locating it can furnish.

All of which is respectfully submitted,

EMERY COBB,
J. O. CUNNINGHAM,
J. H. PICKRELL,
H. C. BURCHARD.

The report of Finance committee on Agricultural, Horticultural, and other appropriations, was then accepted.

REPORT.

The Finance Committee, to whom was referred the subject of asking appropriations from the Legislature the coming winter, would recommend that this Board appoint a committee to bring the matter before said body—being particular to specify each and every item. Said amounts so referred are as follows:

For Horticultural Department,	$22,000
Polytechnic and Mechanical Department	40,000
Agricultural Department	38,000
	$100,000

The committee on Agriculture ask for an appropriation of $3,000 for fences, hedges, teams, etc. The committee report that said amount be appropriated out of our income account, unless we get the above appropriations from the Legislature.

(Signed) EMERY COBB,
J. H. PICKRELL,
WM. KILE,
H. C. BURCHARD,
J. O. CUNNINGHAM.

Judge Brown then offered a resolution that the committee be authorized to sell fifty thousand acres of scrip at a price not less than 95 cents an acre.

An amendment, that the minimum be 100 cents per acre, was lost, and the question upon the resolution to sell at not less than 95 cents per acre prevailed.

On motion of Mr. Burchard, it was

Resolved, That in addition to the appropriations requested by the committees on Horticulture, Agriculture and Mechanical departments, to be made by the Legislature, an appropriation also be asked for the Library, Chemical and Philosophical apparatus, Cabinets, etc., at least of 25,000.

Mr. Cobb and Mr. Lawrence were appointed a committee to prepare a memorial to the Legislature. On motion of Mr. Cunningham, Mr. Goltra was added to the committee.

It was moved and seconded that the Board stand adjourned until the annual meeting.

Carried.

JONATHAN PERIAM,
Recording Secretary.

REPORT OF THE RECEIPTS AND EXPENDITURES OF THE ILLINOIS INDUSTRIAL UNIVERSITY.

RECEIPTS.

1868.			
March	11	Balance on hand	$10,536 90
"	30	Rent from A. Chase	15 26
"	30	Interest on Illinois Bonds	225 00
April	11	J. M. Gregory for freight for self	206 19
"	11	Tuition 43 students at $5.00	215 00
"	11	Incidentals, 75 students, at $2.50	187 50
"	11	Matriculation, 75 students, at $10.00	750 00
"	11	Room rent	221 50
May	4	Amount refunded by M. C. Goltra	1,185 10
"	18	J. M. Gregory for freight on lumber	259 90
"	18	Interest on Champaign County Bonds	10,000 00
July	6	" on $199,000 Illinois 6 per cent	2,270 00
"	6	" on $25,000 Chicago Water Bonds	375 00
"	11	R. M. Eppstein & Bro. for University Buttons	65 55
Aug.	10	J. M. Gregory for hay and corn	429 84
"	21	J. M. Gregory for freight refunded	40 05
Oct.	1	Interest on $50,00 Sangamon County Bonds	2,250 00
Nov.	1	Jonathan Periam for hay, corn and feed	127 60
"	16	J. M. Gregory for tuition, etc	1,000 00
			$32,143 66

EXPENDITURES.

Amount paid for expenses of Trustees			$794 90
"	"	" salaries, wages, etc	10,873 03
"	"	" library, chemical apparatus, mathematical instruments etc.	2,314 56
"	"	" printing, advertising and stationery	696 05
"	"	" labor, materials, and University grounds	3,501 43
"	"	on account of farm	4,789 29
"	"	" students labor	550 03
"	"	" one lot	220 00
"	"	" locating lands	20 00
"	"	" furnace, furniture, etc	947 75
"	"	" lumber	1,496 55
"	"	" freight and express charges	123 00
"	"	" examining and recording title and deeds	114 25
Balance on hand			$5,140 99
Total			$32,143 66

SPRINGFIELD, November 17th, 1868.

JOHN W. BUNN, *Treasurer.*

THIRD ANNUAL MEETING.

URBANA, ILL., *March* 12, 1869.

The Board of Trustees of the Illinois Industrial University met in the library at the University building, at ten o'clock A. M., and was called to order by J. M. Gregory, the Regent. The meeting was opened by reading the scriptures and prayer by the Rev. Isaac S. Mahan.

The following members answered to their names: Allen, Blackburn, Brown of Pulaski, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Lawrence, Mahan, Pickrell, Wright, Van Osdel, the Regent—15;

Which being two less than a quorum, on motion of Mr. GOLTRA, the Board adjourned until two o'clock.

—

TWO O'CLOCK, P. M.

Board met pursuant to adjournment, at two o'clock, P. M., and the following gentlemen answered to their names: Messrs. Allen, Blackburn, Brown of Pulaski, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Lawrence, Mahan, Pickrell, Wright, Van Osdel and the Regent—16, lacking one of a quorum.

On motion of Mr. COBB, the Board adjourned to 4:30 P. M.

—

HALF-PAST FOUR, P. M.

The Board met pursuant to adjournment, at 4:30 P. M., the Regent in the chair. Upon calling the roll the following members answered to their names:

Allen, Blackburn, Brown of Pulaski, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Lawrence, Pickrell, Pullen, Wright, Van Osdel, the Regent—16, still lacking one of a quorum.

On motion, the by-laws adopted by the Board were read as far as Article VII, when, on motion, the further reading was dispensed with.

On motion of Judge BROWN, the Board adjourned to the next day, March 10, at nine o'clock, A. M.

SECOND DAY—MORNING—MARCH 10, 1869.

The Board met at ten A. M., pursuant to adjournment. Reading of scriptures and prayer by Mr. LUTHER LAWRENCE. Present, Messrs. Allen, Blackburn, Brown of Pulaski, Burchard, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Lawrence, Kile, Pickrell, Pullen, Wright, Van Osdel, the Regent—18.

Minutes of the previous meeting were read and approved. The minutes of the last meeting of the Executive Committee were read and approved.

Resignation of Jonathan Periam, as head farmer, on motion of Mr. BURCHARD, referred to the Committee on Agriculture.

Mr. LAWRENCE was called to the chair and the report of the Regent was read, except the concluding portion, for which time was asked.

ANNUAL REPORT OF THE REGENT.

Gentlemen of the Board of Trustees:

The By-Laws require the Regent to make "An Annual Report to the Board exhibiting the progress and condition of the several departments of the University, with such suggestions as he may deem needful for their improvement." The present report marks the close of the first year of actual work of the University. This fact lends to this annual review both interest and importance.

The University was opened for the reception of students the second day of March, 1868. During the brief year allowed for maturing our plans and preparing for the opening, strenuous efforts were made to advertise the University thoroughly throughout the State. The Regent visited many counties and addressed agricultural fairs, and other gatherings of the people. A competitive examination was held in most of the counties, for students, and both the State Superintendent of Public Instruction and the County Superintendents of Schools gave hearty and efficient aid to make the new institution favorably known among the people. The applications for admission were numerous

and but for the false charges which were made against the University before it had put in operation a single plan or done a single day's work, it seemed certain to open with at least 200 or 300 students. There is evidence that many were diverted from their purpose of coming by these mischievous assaults. But notwithstanding all opposition, the first term showed an attendance of seventy-seven students. The second or autumn term opened with a considerable increase of numbers. The entire number who have entered up to the present time is 136.

The distribution of the students in the several courses cannot be precisely stated, since many have been engaged in preparatory studies, and many have not decided upon their course. It is believed that nearly one-third of the whole number are looking to the agricultural course. Several are entering the mechanical course, while others are pursuing engineering or commercial courses.

The instruction was given in the spring term by four instructors, the Regent, Professors Baker and Atherton, and Assistant Professor Burrill. There are now actually employed beside the Regent, three Professors and three Assistant Professors, representing the departments of History, English Language, Chemistry, Agriculture, Botany, Mathematics, Book-keeping and Modern Languages. Besides these, there are two lecturers, one on Pomology, Dr. John A. Warder, of Cincinnati, and one on English Literature, Rev. Edward Eggleston, of Evanston. Professor Powell, appointed by the Board to the chair of Natural History, has tendered his resignation on account of his continued detention with his expedition. I communicate herewith his letter of resignation and also that of Professor Atherton.

It is important that several additions be made to the Faculty before the opening of the next year, in September. The chairs of Horticulture, Mathematics and Mechanics, and either a professor of Natural History or one or two lecturers in this department should be chosen. A lecturer on Geology and another on Zoology, each spending a month with us in the winter term, would sufficiently reinforce those departments of study for the present.

A lecturer on Veterinary Science should also be appointed at an early day. I recommend that the Committee on Faculty and Courses of Study be instructed to recommend suitable persons to fill these places, and employ temporarily such teachers as may be needed before the next meeting of the Board.

STUDIES.

According to the plan of the University the students have been left entirely free to select their own studies. These students are not mere boys, but mostly grown men, many of them having been engaged in teaching or other independent business for their own support. They are competent judges of their own tastes and needs. To attempt to impose any study upon them without their consent would be simple oppression, and to refuse them any study the law requires us to teach would be equal oppression.

Most of the students have studied during the year some branch of Natural Science, as Natural Philosophy, Chemistry or Botany. Many have studied Book-keeping, English Composition, History, and all have either studied or

attended lectures on Agriculture. A considerable number, and always at their own option, have studied either the ancient or modern languages. Considering the somewhat violent prejudices which many persons have conceived against the languages, it is perhaps a pity that these young men should have chosen to embrace language among their studies. But as none of the so-called, more practical studies have been neglected on account of the languages, we may leave these students without offence to gain the advantages or suffer the loss resulting from their choice.

I cannot forbear to remark here, that to my mind it is a most pitiful business that any one should have narrowed this magnificent question of industrial education down to a petty debate on the study of languages—a matter which seems to me as irrelevant as the question whether students shall eat butter with their toast, or take sugar in their coffee—and a matter over which we as trustees have little or no control, since the laws of Congress and of the State forbid the exclusion of classical studies.

The Faculty, without exception, came from the laboring classes. They were all trained in boyhood to hard labor, and, by their own industry, won and paid for the education which now enables them to teach others. Becoming educated men, they have not ceased to be practical men—farmers and mechanics. Holding each a different creed, they work with one heart for interests broader than sects, and dear as humanity itself.

CHEMICAL LABORATORY.

The chemical laboratory has been opened for students, and I submit herewith Prof. Stuart's plan of compensation for chemicals used by students. In January Dr. Warder gave a course of twelve lectures on vegetable physiology and fruit growing, which were attended by the entire body of students. Most of the students also attended the lectures and discussions of the Farmers' Institute held at the University in January. The influence of these lectures was happy, in helping to create a fresh interest in agricultural affairs.

STUDENT LABOR.

During the spring term the students labored two hours each day. In the autumn the time was reduced to one hour per day, as we were unable to provide employment for so large a number of students for a longer time. The labor system has cost much solicitude and care on the part of those managing it, and it will always be attended with many difficulties; but so manifold are its advantages that we may well question whether it ought not to be persevered in against even greater obstacles. It is difficult to see how we are to give the practical character and bearing we all desire to our courses of instruction, without these practical exercises on the farm, or in the gardens. All book study tends to grow unpractical and abstract. It must be closely linked with the daily exercise of the senses and muscles in the same field of study, if you will insure it against dwindling to mere theorizing.

It is often urged upon us by those who never stop to inquire into the facts, that our students will be farmers' sons, who get their practice at home. Now it happens that a large proportion of our agricultural students come from the

cities or villages, and are the children of merchants, lawyers, etc., who often desire to make farmers of their sons. Such was also the case at the Michigan Agricultural College, while I was acquainted with it, and such will be largely the case with all the agricultural colleges. This is a fact we should hold in mind, or as trustees we may be imposed upon by unfounded assumptions.

But while these students of agriculture, who come not from the farms, certainly need the practical training furnished by the labor plan, those who come from the farms will be more helped than hindered by the fresh practice, tice, under different guidance, which they find here. I do not stop to urge again the considerations of health, of physical culture, of honor done to labor, and of the aid furnished to indigent students, by the labor system. It is useful for all these reasons, but it seems indispensable as a part of a practical education. It is certainly a very significant fact that most of the agricultural colleges are adopting it. The Massachusetts Agricultural College requires one hour a day. Maine also requires it. Michigan has maintained it for years. Iowa and Kansas require labor; and President White, of Cornell, said lately that a labor system to enable students to pay their way is *desirable*, but educational labor is *essential*.

The main difficulty of the labor system is to apply the labor effectively and profitably. To accomplish these ends, the labor should be performed in small parties, and under close supervision. I am inclined to believe that the maximum rate of compensation should be r ised to twelve and one-half cents an hour, which is the price paid for volunteer labor. Inferior wages tempt to inferior performance of work. But lower rates may be paid for young or inferior workmen, and forfeiture of some part of the wages may be imposed for unexcused absence, or gross neglect of duty in the labor. Mechanical students ought, as far as practicable, to be furnished with mechanical labor.

I would also suggest that lots of half an acre or one acre be allowed, under proper conditions, to such students as may desire it, for experiments in agriculture or horticulture.

THE FARMS.

The work upon the farm and garden during the past year has already been reported to you in the report of Mr. Periam, the Head Farmer, made in November last. Much could not be done with the very limited means at our command, but Mr. Periam accomplished a good season's work in preparing the grounds for future cultivation. His services have been quite valuable and important.

The Griggs farm was rented for $1175.

A considerable part of the stock and experimental farms were rented, under such stipulations as to crops and culture as would best prepare them for their future uses. The rents received in kind for the portions so rented are estimated at $———. The remainder of these farms have been cultivated by the University force.

We are now prepared to begin the development of the several farms with reference to their final use. The Board will remember that, according to the plan of organization early adopted, the Professor of Agriculture is the Super-

intendent of the Farms—these being his laboratory and apparatus of illustration. It was also provided that his plans for the management of the farms should be annually submitted to the Regent and Faculty, and, after discussion and adoption by them and the Trustees or Executive Committee, shall be put on record. I have the pleasure to submit herewith Prof. Bliss' plans of management for the farms for the current year, which have been discussed and concurred in, though not formally adopted by the Faculty. To make clear the aim and scope of his plans for the year, he has presented a series of diagrams, exhibiting the proposed rotation of crops on the stock farm for the next ten years.

Accompanying this report, I submit a paper from Prof. Bliss, prepared by my request, and a plot illustrating his suggestions regarding the ultimate subdivision of the Experimental Farm. I concur heartily in his suggestion of the need of an intelligent foreman to aid in carrying out the practical work on the farms, and recommend that he be authorized to employ such foreman at a reasonable rate, and also such other farm laborers as may be necessary.

The 200 acres lying nearest the University will doubtless be found sufficient both for the horticultural grounds and the experimental farm. The plan accompanying this report exhibits the proposed distribution of this 200 acres, which is as follows, beginning on the north, next the street railroad:

For arboretum, ten acres.

Allowing sixty trees to the acre, which it is believed would leave abundant space for the paths and drives, this would afford room for 600 trees. Only eighty species are reported as indigenous to Illinois. But a much larger number can be acclimated here from other parts of this continent, and from the old world. The arboretum should be divided so as to exhibit, as far as practicable, the trees of each quarter of the globe by themselves. A distinct department should be made of the Illinois trees.

Next the arboretum, if the ground is suitable, may be placed the nurseries, occupying five acres.

Next this is the market garden, ten acres.

These two departments, which will furnish considerable labor for students, will thus be found near at hand.

Next may follow the small fruit plantations, viz;

For strawberries, two acres.

For raspberries, blackberries, etc., two acres.

For currants, gooseberries, whortleberries, two acres.

For grapes, two acres.

These plots will be large enough to exhibit the several varieties of these fruits.

This will bring us near a swale or slough susceptible of perfect drainage, but probably unsuitable, on account of its greater liability to early frosts, to most of horticultural purposes. It may be used for the cranberry or other shrubs or trees loving a wet soil.

Passing this swale we again reach high ground, where we may plant our specimen and experimental gardens requiring five acres. In this garden we

should exhibit as large a variety as possible of culinary vegetables; carefully measured plots should also be provided here for experimenting with the different fertilizers and modes of culture.

Through the 160 acre lot, two farm avenues should be extended, one from north to south and the other from the east to the west. These may be lined on either side by deciduous or evergreen trees, serving at once to give beauty and to serve as shelter belts. Near the outer gateways, opening into these avenues, small and tasteful cottages should be placed both to accommodate the farm laborers, and to provide protection for our grounds. The grounds embracing about fifty-three acres west of the north and south avenue is judged to be fit for orcharding, and may be occupied as follows:

1. By specimen apple orchard, sixty trees to the acre, planted in quincunx order. ..... 25 A
2. Market apple orchard of approved varieties..... 10 A
3. Cherry orchard ..... 5 A
4. Pear orchard, dwarf and standard..... 5 A
5. Peaches, plums and other fruits..... 5 A
6. Roads and shelter belts ..... 3 A

These orchards should be well protected by both hedges and a paling fence, and may be surrounded by a shelter belt of evergreens.

East of the north and south avenue there will be found abundant space and favorable grounds for the farm experiments. Room will be found here also for the plots spoken of for students.

East and south of the crossing of the farm avenues will be found a favorable site for a superintendent's house and a large barn, unless it is deemed best to place these at north entrance to the experimental farm. A plan and estimates for a barn are herewith presented, as also plans for laborers' houses.

HORTICULTURAL GROUNDS.

There is herewith presented a colored plan for the ornamental grounds about the University building, and some plans are expected to be contributed by Mr. Letz, of Chicago, for the glass structures needed. It is hoped that some part of these structures may be erected the current year. Mr. Franks, the gardener, has made good use of the small propagating house erected last fall, and has a large number of bedding plants to adorn our grounds this summer. A small appropriation is asked for seeds, ornamental trees and shrubs and tools for this department, as stated in the accompanying schedule.

An appropriation of $600 is needed for seeds, stocks, and young trees for the nurseries. We have a bill of imported evergreens offered us at rates which seem quite favorable, with a guarantee of excellent condition.

The 3,000 specimen apple trees already received, will cost $750. Other trees, for orchard and arboretum, needed this spring, will cost about $700.

The entire orchard grounds, and as much as practicable of the gardens, should be underdrained at once. One main drain has already been put down through the ornamental and parade grounds. Another should be made at once on the west side. Hedges also may be set at once along the east and west lines of garden plots and experimental farms.

It is asked that a strip fourteen feet wide be relinquished to the public from the west side of the forty acre lot. This will make the line correspond with the west line of the University grounds and make the street of equal width throughout.

I recommend also that a proffer be made of one-half of a four rod street along the north line of experimental farm, between Wright street and Mt. Hope avenue.

In order to save to the Trustees the opportunity to buy the two lots which separated our lots south of the Springfield road, and which I judged would be needed in time for buildings, I purchased these lots at very reasonable rates, and now hold them subject to the decision of the Board. The purchase price was $400.

MECHANICAL.

The shop erected last summer will not be sufficient for our work if much building is to be done this summer. I recommend that the stable now occupying one part of it be vacated and the whole be fitted up as a shop. We have several students in the mechanical course who have sought for practice in the shop, and are already exhibiting some skill in the use of tools. If a supply of tools can be furnished they will render effective service in our building operations.

We shall need at once some draughting tables or stands for the students in mechanical drawing. It should not be forgotten that instruction in Mechanics is as obligatory upon us as instruction in Agriculture, and a Professor in this department should be put on service at the opening of the fall term at latest.

THE UNIVERSITY BUILDING.

The intense heat of the last summer so nearly ruined the slate composition roofing, that only by repeated patching have we been able to keep out the rains. It is evident that the roofing must at once be replaced by something more substantial. I recommend that a good tin roof be put on and well painted.

A slight inspection will also convince you that something must be done immediately to preserve the brick of the basement story from further decay. A good coating of stucco or mastic might perhaps suffice. The steeple and cornice need repainting, and I recommend also that the side walls in the several halls be painted to some height at least, that they may be more easily washed and kept clean.

An ornamental gateway, the gift chiefly of Mr. John Burchard, of Beloit, is ready to be erected at the main entrance.

The sidewalk on the west front should be extended to the Springfield road, if not across the brook.

FINANCES.

I report herewith a statement of the warrants issued during the year. The total expenditure for all purposes, not including the railroad donation, nor the trees, etc., donated by Champaign county, from Dunlap's nursery, is

$36,698 03. The purposes for which these expenditures have been made, are submitted elsewhere.

These expenditures have slightly exceeded the estimates for the year, but a portion of them has been made in anticipation of the appropriation, and are properly chargeable to it as permanent improvements. Some considerable income may yet be expected from the sale of farm produce now on hand and from rents.

The Treasurer's report will give you a statement of the receipts of the year.

The amount received on account of the Illinois Central Railroad freight donation, up to March 1st, is $3.

The accompanying statement will show the number of trees and shrubs received from Mr. Dunlap, together with the sizes of the same. These have been taken by actual count and measurement on the ground made by the gardener. A few trees, which were mostly overgrown when received, have died, an account of which is added. Mr. Dunlap has not yet presented any written statement of the account. The officers who received these trees had nothing to do with fixing prices, those being determined by the deed of gift as at "catalogue rates." It will be necessary, therefore, for the trustees to settle the account thus far, and decide how much more is due on the donation.

An application was made in due form to the Legislature for an appropriation for the several departments, and copies of the memorial prepared have already been seen by you. A bill making an appropriation of $60,000 has passed the House of Representatives and is now pending before the State Senate.

Patents have already beed issued for most of our lands, and taxes have begun to accrue. Ought not some plans and terms of sale of these lands to be adopted at once?

LIBRARY, CABINETS AND APPARATUS.

Some additions have been made to the library since the last meeting of the Board, but it is still wholly inadequate to our needs. If the appropriation now pending is passed, I recommend that the Library Committee be authorized during the coming summer to make such purchases as are needed.

A paper relating to botanical excursions, proposed by Assistant Professor Burrill, is herewith submitted. I heartily recommend that he be furnished with the necessary materials and outfit, and that as far as practicable he and his class be encouraged to make excursions, if not in term time, at least, in the vacations.

The cabinets we have in possession are here only on exhibition, and are offered for sale. Measures should be taken this present year to begin the collection of cabinets.

A set of meteorological instruments ought to be provided at once, that a series of regular observations may be opened here at an early date. I am informed that a full set will cost $100.

HONORARY SCHOLARSHIPS, ETC.

The language of the statute, strictly construed, restricts the honorary or free scholarship provided for each county to the descendant of a soldier or sailor. It is, however, permitted to the Board to provide other honorary scholarships. In order to give some regularity to this business, I recommend that it be provided by resolution that when the regular honorary scholarship in any county is not claimed, one free or honorary scholarship be offered to such student as shall pass the best examination and shall be of good character and promise.

There is already one application from a graduate of a college to come here and study as a resident graduate. Other applications of this sort may be received. I would recommend that a rule be adopted that resident graduates be admitted on the payment of the ordinary fees, excepting the matriculation fee.

On motion of Mr. BURROUGHS the report of the Regent, with the accompanying documents, was referred to the proper standing committees.

Mr. BURROUGHS' resolution was as follows:

Resolved, That the different subjects contained in the Regent's report be referred to the several committees on the subjects, for the coming year, and that a committee on nominations be now appointed to bring in, as soon as possible, names of such committees.

Carried.

On motion, Messrs. Lawrence, Edwards and Goltra were appointed a Committee on Nominations.

On motion of Mr. GOLTRA, Mr. J. S. Slade was invited to take a seat with the Board.

Moved and seconded that the new members be sworn in.

Carried.

Messrs. Pearson, Griggs, Kile and Wright were then sworn in, Judge Ayres administering the oath.

On motion, the report of the Treasurer was read.

TREASURER'S REPORT.

November 12, 1868.	By balance	$6140 99
December 9, 1868.	By J. M. Gregory, tuitio , etc., balance for fall term	169 50
January 4, 1869.	By interest on $109,000 Illin is bonds	3270 00
January 4, 1869.	By interest on $25,000 Chicago water bonds	875 00
January 27, 1869.	By J. Perl m, sales of farm produce.	328 34
January 27, 1869.	By J. Periam. notes for rent of land.	468 75
March 5, 1869.	By J. M. Gregory, collection of fees for winter term	785 50
		$12,088 08

To amount paid for salaries	$4468 24
To amount paid expense of trustees	432 20
To amount paid salaries, expenses, for lecturers	883 45
To amount paid for insurance	251 50
To amount paid Superintendent's salary and labor for farm	1239 74
To amount paid students' labor	404 40
To amount paid for printing and advertising	127 50
To amount paid for coal and wood	288 55
To amount paid for wages of carpenter, gardener and janitor	681 33
To amount paid for library apparatus and cabinet	549 50
To amount paid for freight and express charges	55 20
To amount paid for stationery	11 60
To amount paid for draining tile	270 00
To amount paid for labor, material for University and grounds	1053 68
Balance on hand	1324 59
	$12,088 08

CHAMPAIGN, ILL., *March* 9, 1869.

JOHN W. BUNN,
Treasurer.

[The above report, as will be seen, embraces only the latter part of the year, from November 12, 1868. The report for the first part of the year was made to the Board at the meeting in November, 1868.]

On motion of Mr. BURCHARD, the report of the Treasurer was referred to the Auditing Committee.

Then the report of Committee on Military Department was received.

On motion of Mr. BURCHARD, it was received and laid on table for future action.

Judge BROWN offered the following resolution:

Resolved, That the Treasurer be authorized to sell 50,000 acres of the remaining land scrip, at such prices as he may be able to obtain: *Provided*, he shall not sell at a lower price than may be approved by the Finance Committee.

On motion of Mr. PEARSON, it was laid on the table until Thursday morning, March 11.

Judge BROWN moved then, that the Finance Committee be instructed to devise and report to the Board a plan for putting on the market and selling the lands entered by virtue of the Congressional scrip issued to this University.

On motion, the bills and accounts now in the hands of the Regent were referred to the Auditing Committee.

Mr. J. H. PICKRELL offered the following resolution:

Resolved, That the boarding arrangements made with Mr. Aaron Potter, as set forth on page 93 of Annual Report be annulled, and that the Executive Committee are directed to sell or otherwise dispose of the fixtures, and give Mr. Potter notice to vacate the premises.

Carried.

Mr. M. L. DUNLAP moved that the Committee on Library and Cabinets be directed to settle with Prof. Powell in regard to specimens of natural history, and that any expense incurred in relation to same be paid out of the library fund.

Laid on the table.

Mr. EDWARDS made the motion that Messrs. Edwards, Pearson and Pullen be a committee of three to make a final settlement with Mr. Dunlap in regard to the donation of $2,000 worth of trees and shrubbery, and report the same to this Board before its adjournment.

Carried.

Motion to adjourn until two o'clock P.M. prevailed.

—

TWO O'CLOCK P. M.

Board met pursuant to adjournment—Regent in the chair.

On motion of Mr. PICKRELL, Mr. Slade was asked to take his seat, and be qualified as soon as the proper officer should arrive—a telegram having previously been read from Senator Flagg, stating that the new Trustees had been confirmed by the Senate, except Mr. Scott.

The committee to which was referred the nomination of the standing committees made their report.

A motion to recommit their report was carried.

The committee then reported back the following nominations, as amended:

Executive Committee—Regent, Cobb, Brown of Pulaski, Pickrell, Cunningham, Griggs, Goltra, Pullen and Wright.

Agricultural Department—Pickrell, Johnson, Allen, Kile and Blackburn.

Horticultural Committee—A. M. Brown, Pullen, Galusha, Pearson and Edwards.

Finance Committee—Cobb, Burchard, A. M. Brown, Pickrell and Griggs.

Building and Grounds—Goltra, Van Osdel, Griggs, Cunningham, Johnson and the Regent.

Auditing Committee—Lawrence, Dunlap, Cunningham, Pearson and Galusha.

By-Laws—Burchard, Lawrence, Slade and the Regent.

Faculty and Course of Study—Regent, Edwards, Pickard, Hayes, Bateman and Blackburn.

[Mr. Griggs substituted for Mr. Pickard. See page —.]

Military Affairs—Brayman, Dunlap, Scroggs, Kitchell and Kile.

Library and Cabinet—Regent, Bateman, Mahan, Allen, McMurray and Slade.

Mechanical Department—Van Osdel, Brown of Chicago, Dunlap, Goltra and Griggs.

On motion, the nominations were adopted.

The question arising whether, in the election of officers, a majority of the full Board should be required to elect, or only a majority of the members present,

Mr. PICKRELL offered the following resolution:

Resolved. That in the election of officers, a majority of the members present (being in all cases a quorum) shall only be required; and that all resolutions and rules of the Board in conflict with this resolution are hereby repealed.

Carried.

Judge BROWN moved that the Board proceed to the election of officers.

Carried.

On motion of Mr. LAWRENCE, the subject was deferred, and made the special order for Thursday, March 11, at ten o'clock A.M.

The Finance Committee then reported as follows:

REPORT OF FINANCE COMMITTEE.

The Finance Committee submit the following:

The gross expenses for the year ending March 1, 1869, are as follows:

Board expense	$2,381 26
Library	809 12
Land scrip	219 25
Salaries	13,000 00
Chemical apparatus	978 00
Engineering instruments	545 45
Philosophical apparatus	504 50
Fuel, lights, repairs and incidental expenses	3,175 04
Improvements and alterations in buildings and grounds	8,222 12
Farm and garden, including purchases of teams, wagons, implements, fencing, building of barn, and running expense	7,863 28
Total	$36,698 02

Receipts for the year ending March 9, 1869, were as follows:

Interest on Champaign county bonds	$10,000 00
Interest on Illinois bonds	6,885 00
Interest on Sangamon county bonds	2,250 00
Interest on Chicago water bonds	1,750 00
J. M. Gregory, for freight	649 18
Rent of farm lands	468 75
Tuition and other fees	3,329 50
Sales of produce of farm	941 27
M. C. Goltra, refunded on land scrip	1,185 10
R. M. Eppstein, for University buttons	65 55
	$27,503 85
Amount on hand, March 9, 1868	10,173 10
Total	$37,676 95
Less disbursements	36,698 02
Leaving balance in hands of Treasurer, after paying warrants now outstanding	$978 93

At our November meeting, the Treasurer and Finance Committee were authorized to sell 50,000 acres of land scrip at ninety-five cents. As yet we have not been able to effect a sale, and would suggest that the limit be removed, and authority to sell without limit be granted.

The location of the 25,000 acres of scrip will probably be attended to at as early a date as possible the coming spring and summer, by the Treasurer and Mr. Goltra, in whose hands it was put at our November meeting.

The sale of lands already located should receive attention as soon as practicable; and with a view of furthering the same, the Treasurer was authorized, at our November meeting, to procure books, classifying said lands, with such other information as could be obtained in relation to them.

The interest-bearing securities in the hands of the Treasurer remain the same as at our November meeting. The Treasurer and the Chairman of the Finance Committee are doing their utmost to obtain county bonds (issued for other than railroad purposes) bearing a rate of interest at least eight per cent., into which we may convert most or all our Illinois bonds, bearing six per cent.

The estimates of expenditures for the coming year will have to be made after the Board, through the various committees, have signified their wishes in regard to improvements, etc.

In regard to our expected appropriation from the State, we would recommend that the Board, before its adjournment, should signify its wishes as to the expenditure of the same, as much in detail as possible, and would recommend that it should be put in substantial improvements, economically as may be, and strictly for the purposes appropriated.

Respectfully submitted.

EMORY COBB,
H. C. BURCHARD.

On motion, the report was accepted and approved.

It was moved that the report of the Regent be taken up in detail, and allotted to the appropriate committees.

On motion, the first or introductory portion was referred to the Committee on Faculty and Course of Study; so much as relates to the farm, to the Committee on Agriculture; so much as relates to buildings and grounds, to the Committee on Buildings and Grounds; so much as relates to Horticulture, to the respective committee; so much as relates to Library and Cabinets, to the committee on same; so much as refers to the Mechanical Department, to the committee on this department; so much as relates to Finances, referred to the Committee on Finances; so much as relates to warrants drawn, to the Auditing Committee; so much as relates to honorary scholarship, to the Committee on Faculty

and Course of Study; so much as relates to newspapers and scurrilous reports, be referred to a Special Committee, consisting of Messrs. Pearson, Lawrence and Blackburn.

On motion, the Board took a recess until 7 o'clock P. M.

SECOND DAY—EVENING—7 O'CLOCK.

Board was called to order at 7:30 P. M. Regent in the chair.

The roll being called, the following gentlemen answered to their names:

Allen, Blackburn, Brown of Pulaski, Burchard, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Griggs, Lawrence, Mahan, Kile, Pickrell, Pullen, Wright, Van Osdel, the Regent—20.

Report of Finance Committee in relation to accounts, was then received and adopted.

REPORT OF COMMITTEE.

Your committee to whom was referred the resolution in regard to the appointment of a book-keeper, with instructions to examine the books of account of the University, would respectfully report that they have considered the resolution in regard to the appointment of a book-keeper, and while they find the latter correctly kept, yet they deem it advisable that fuller accounts and entrees should be made so that the books will show, at all times, the monetary transactions, and exact financial condition of the University, and that accounts should be opened so as to exhibit the receipts and expenditures in each department as well as the general expenditures and the amount of debit or credit of every fund or appropriation.

Your committee would, therefore, recommend the passage of the following resolution:

Resolved, That the Finance Committee be instructed to employ a competent accountant, and to see that a set of books be opened in double entry, in which shall be represented the entire business of the University, including distinct accounts of the leading sources of income and expenditures; and the said accountant to present a proper balance sheet at each annual meeting of the Board, and oftener, if required; and said books to be open at all times to the inspection of the Trustees and Officers of the University; and said accountant shall be subject to the call of the Regent or Recording Secretary for any clerical services they may require.

Carried.

On motion of Mr. VAN OSDEL, a committee of three, Messrs. DUNLAP, PURCHARD and COBB were appointed to examine the books for errors, if any there be.

The Auditing Committee made a report as follows:

REPORT OF AUDITING COMMITTEE.

The Auditing Committee to whom was referred the Treasurer's Report, beg leave to report that they have examined the same, with the vouchers accompanying, and find that the accounts have been kept correctly, and show that warrants numbered from 1 to 412, inclusive, have been paid except No. 113 for $179, and No. 403 for $166 66, amounting to $345 66, leaving a balance now in the Treasurer's hands of $1324 59.

The committee recommend that the report be accepted, and that they have canceled the warrants from No. 279 to No. 412, inclusive, except No. 403, by cutting a notch in lower side of the same.

They have examined the following bills and recommend that warrants be ordered for the payment of the same, viz:

Doty & Mitchel	$50 00.
Walker Brothers	9 37.
O. L. Barber	25 00
J. A. Hutchinson	16 00.
Mowlding & Harland	66 00.
W. S. Maxwell	2 00.
William Price	27 80.
Dodson & Hodges	81 58.

Respectfully submitted.

L. W. LAWRENCE,
JOHN M. PEARSON,
O. B. GALUSHA,
M. L. DUNLAP,
Auditing Committee.

On motion, the report was adopted.

The following resolution was offered by Mr. EDWARDS:

Resolved, That female students be admitted to recitations and class lectures on the same terms as to qualification and charges for tuition as male students. But in no case are they to have rooms in the institution; and shall be under such rules and regulations as the Faculty shall from time to time prescribe, until otherwise ordered by the Board.

On motion, it was postponed until Thursday, 11 o'clock A. M.

The Special Committee to whom was referred that portion of the Regent's report relating to newspaper criticisms, reported that the same should be expunged from the records, together with the report relating thereto.

The report of the Committee on Buildings and Grounds was read. (See report, page—.)

After discussion, on motion of Mr. BURROUGHS, it was voted that this report and all other reports which may be made calling for appropriations, be referred to the Committee on Finances, with instruction to report to the Board a schedule of all the appropriations asked for.

The report of the Horticultural Committee was read, and on motion recommitted to be reported Thursday.

Report of the Committee on Mechanical Department was referred to Finance Committee.

Report of the Committee on Agriculture was read and adopted.

REPORT.

The Committee on Agriculture beg leave to report that they have had the resignation of Mr. PERIAM under consideration, and would recommend that it be accepted. We have also partially examined his accounts and vouchers, and have no hesitation in saying that we believe them correct. We also find that there is an item charged against the farm of team labor performed at the grounds of the University building amounting to $831 75; also an average of three months time of the Superintendent was spent on the grounds of the building, which would make an amount of $375. These two items we would respectfully ask may be placed to the credit of the farm and charged to their proper accounts.

We have had under consideration that portion of the Regent's report accompanied with plans for the future rotation of crops, etc. We would say that we fully concur in said reports and recommendations, except so much of it that requires the Professor of Agriculture to submit the management of the farm to the Regent and Faculty for their approval. We would respectfully ask that instead of the Faculty, the Committee of Agriculture be substituted, and that only so much of the plans of the Professor of Agriculture as may relate to the classes shall be submitted to the Faculty.

We would also recommend that the Professor of Agriculture be empowered to employ such help as he may deem necessary, and keep separate and correct accounts of the farm and his acts and doings, to manage the farm known as the Experimental and the Busey Farm.

The Griggs Farm, we understand, has been satisfactorily rented for the next year. We would respectfully ask that the Professor of Agriculture be authorized to have an accurate survey of the Busey Farm made, in order that the hedges may be set in the proper place. We would further recommend that the present crop of produce that will not be needed for the farm should be sold and placed to the credit of the Farm account.

All of which is respectfully submitted.

J. H. PICKRELL,
WILLIAM KILE,
A. BLACKBURN,
LEMUEL ALLEN.

Mr. PEARSON moved that the recommendations of Prof. Stuart in relation to needed apparatus and chemicals, and the method of using and disbursing the same, be referred to Committee on Mechanical Department.

Carried.

Report of Military Department was then read, and, on motion, recommitted, to be reported Thursday, March 11, 10 A M.

Mr. EDWARDS introduced the following resolution:

WHEREAS the Board of Trustees contains too many members, incurring too much expense, therefore

Resolved, That the Board suggest to the General Assembly the propriety of so amending the law in regard to the number of Trustees, that the Board shall hereafter consist of one member from each Congressional District and the present members *ex-officio*, a majority of whom shall form a quorum.

Resolved, That the Recording Secretary transmit a copy of these resolutions to the Governor.

On motion it was laid on the table.

Mr. BROWN offered the following resolution:

Resolved, That fourteen feet in width along the west side of the forty-acre tract be conceded to the public, for the purpose of widening the avenue along the line.

It was moved that the resolution lie on the table. Lost—yeas 9, nays 12.

On motion, the whole matter was recommitted to the Committee on Buildings and Grounds.

The following motion was offered by Mr. PICKRELL:

I move that tuition be free for the Departments of Agriculture and Mechanic Science and Engineering, and that five dollars per term be charged for the other scientific and classical studies; that twelve dollars be charged for the use of chemicals and apparatus in the Department of Analytical Chemistry, and that two and a half dollars per term be charged to all students for incidental expenses, provided that students holding honorary scholarships shall be exempt from incidental expense.

After discussion, Mr. PICKRELL offered the following:

Moved, that the question of tuition be reconsidered, so far as may apply to the next calendar year.

On motion, they were referred to the Finance Committee.

Mr. BLACKBURN offered the following resolution:

Resolved, That the two lots referred to in the Regent's report, purchased by him and offered the University at cost, be accepted, and he be directed to draw upon the Treasurer for the amount required for this purchase and the proper conveyance of said lots to the University.

On motion, it was referred to the Finance Committee.

The Special Committee, to whom was referred the bill of Mr. Dunlap, made the following report:

Your Committee, to whom was referred the bill of Mr. Dunlap for trees and shrubbery furnished the University, would report, that whilst in many localities the prices of many of the articles would be considered too high, yet, owing to the scarcity or impossibility of obtaining the larger sizes of trees and plants, either here or at any point near by, at lower figures, also from the fact that such plants are much more valuable if obtained near home, under the circumstances we recommend the allowance of the bill as before us. The amount of the bill is $1,547, and now due $453.

SAMUEL EDWARDS,
JOHN M. PEARSON,
B. PULLEN.

The report was recommitted to the Committee for further consideration.

On motion of Mr. COBB, it was resolved that the balance of trees be received by the Horticultural Committee.

On motion of Mr. BROWN, the name of Mr. Griggs was added to the Committee on Course of Study, in place of Mr. Pickard.

The Board thereupon adjourned to Thursday, March 11th, at 9 o'clock, A. M.

THURSDAY, MARCH 11, 1869—10, A. M.

Board called to order at 10 o'clock, A. M. Reading of the Scriptures and prayer by Mr. BLACKBURN. Upon calling the roll, the following gentlemen answered to their names: Allen, Blackburn, Brown of Pulaski, Burchard, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Griggs, Kile, Lawrence, Mahan, Pickrell, Pullen, Slade, Wright, Van Osdel, the Regent—21.

The previous minutes of the present meeting were read, and adopted as amended.

The special order for the election of officers was brought up. The REGENT called Mr. Allen to the chair.

Mr. LAWRENCE moved that Mr. Burchard administer the oath to such members as had not already been qualified.

The oath of office was duly administered to Mr. Slade.

Mr. EDWARDS moved that all persons, except reporters for the press, be requested to retire during the election of officers.

After discussion, the motion was withdrawn.

Mr. MAHAN moved that all persons not members of this Board be requested to withdraw.

It was moved that this motion lie on the table.

Carried.

Mr. COBB moved that tellers be appointed.

Carried.

The CHAIR so appointed Messrs. Cobb and Goltra.

Mr. EDWARDS nominated Jonathan B. Turner for Regent of the Illinois Industrial University.

Judge BROWN nominated Dr. J. M. Gregory for re-election as Regent.

On motion, the Board proceeded to ballot for Regent. It was moved that the roll be called, and that members come forward and deposit their ballots.

Upon the roll-call, twenty came forward—Messrs. Allen, Blackburn, Brown of Pulaski, Burchard, Burroughs, Cobb, Dunlap, Edwards, Pearson, Galusha, Goltra, Griggs, Kile, Lawrence, Mahan, Pickrell, Pullen, Slade, Wright, Van Osdel.

The CHAIR announced the vote as follows: J. M. Gregory, 17; J. B. Turner, 2; blank, 1.

The CHAIR thereupon declared Dr. J. M. Gregory elected.

On motion of Mr. BROWN, a committee was appointed to notify Dr. Gregory of his re-election. Messrs. Brown and Pickrell were appointed said committee.

Dr. GREGORY was introduced, and returned thanks in a few eloquent words.

On motion of Mr. BURCHARD, it was voted that the election of officers be proceeded with in their regular order. John W. Bunn was nominated as Treasurer, and, on motion, Emery Cobb was authorized to cast for him the unanimous ballot.

Twenty votes were cast, and Mr. Bunn unanimously elected.

On motion, Mr. FLAGG was elected Corresponding Secretary unanimously, as by the preceding vote.

Prof. W. F. BLISS was unanimously elected Recording Secretary, as by the preceding vote.

The committee to whom was recommitted the consideration of Mr. Dunlap's bill of trees, made their report.

ADDITIONAL REPORT OF SPECIAL COMMITTEE.

Your Committee, to whom was referred the bill of trees and contract of M. L Dunlap, would respectfully represent that they have given the subject some farthe

attention, upon consultation with Mr. Dunlap have agreed with him and he with them to change the price of Norway Spruce from $2 00 each to $1 75, as follows:

500 Norway Spruce, @ $2 00	$1,000 00
should be, 500 Norway Spruce, @ $1 75	875 00
Making Cr. on said bill of	$125 00

showing balance due University, in stock, of $578.

The Committee also feel that it is due to Mr. Dunlap to say, that in delivery of the balance of the contract he desires the Committee of Selection to take notice of the prices charged at the time, and assures this Committee that if said prices are objectionable he will pay the balance of the contract in cash; we therefore append the following;

Resolved, That said account be amended to correspond with the above statement, and the balance of stock taken from Mr. Dunlap's nurseries as soon as convenient.

SAMUEL EDWARDS,
B. PULLEN,
JOHN M. PEARSON,
M. L. DUNLAP.

Mr. BURCHARD moved to amend as follows:

Strike out $1 75 and insert $1 50, which appears by the catalogue furnished by Mr. Dunlap to the Committee to be the lowest catalogue price.

Question on the amendment voted nay. Question on the original motion voted aye. Question on the adoption of the additional report, voted aye.

The report was adopted.

Mr. COBB offered the following:

Moved that the chairman of Committee on Agriculture be added to the Horticultural Committee as agents of this Board to receive the balance of Mr. Dunlap's donation of trees and shrubbery.

Carried.

The report and resolutions of Committee on Horticulture was then received and referred to the Finance Committee.

The Committee on Horticulture, to whom that portion of the Regent's report relating to the Horticultural Department was referred, ask leave to submit the following report:

The impossibility of making a personal inspection of the grounds, prevents the Committee from forming any very intelligent opinion of the merits of the plan recommended for the division of the grounds to be devoted to orchards, gardens, etc. It seems to them that there is no material difference between the plan of the Regent and that recommended in the report of the Committee on Horticulture made to this Board at its last November meeting. They recommend adherance to the plan of that Committee, to be worked out as the means at the disposal of the Board in the future may enable us to do it.

If the Legislature should pass the appropriation expected, we shall have $10,000 available for expenditure the present year and the same amount for the year 1870.

Your Committee recommend the construction of the barn and gardener's house estimated for in the report to which they have referred above, and that there shall be no permanent tree planting except the 3,000 trees purchased from Lawver—an osage hedge around the grounds and the timber belts provided for in the November report.

These belts will require the following trees, to-wit:

330 European Larch.
450 Norway Spruce.
330 White Ash.
165 Silver Maple.
330 Austrian Pine.
165 White Pine.
250 Arbor Vitæ.
210 Green Ash.
165 Red Cedar.
250 Blue Ash,

Of these, the evergreens should be 2½ feet high and the deciduous trees 3 to 6 feet high. The estimated cost of these is $534 60.

The Committee think that for all plantings except those indicated above, small trees should be purchased, as far as the means will allow, and cultivated in nursery for one or more years.

Your Committee recommend the following appropriations, viz:

Trees for timber belts	$600 00
Other trees, nuts, seeds and plants	1,000 00
Orchard, including the two purchased from Lawver	1,000 00
Hedge plants	18 00
Gardener's house	600 00
Barn and out buildings	2,000 00
1 Span horses	300 00
1 Wagon and harness	150 00
Tile draining orchard	2,000 00
Labor one year	1,332 00
	$10,000 00

Your Committee ask the adoption of the following resolutions:

1. *Resolved*, That the plan for dividing and planting the grounds to be devoted to horticulture, devised and recommended by the last November report of this Committee, be adopted, subject to such modifications and amendments in the details as may hereafter, upon the farther survey of the grounds, be deemed necessary.

2. *Resolved*, That until a Professor of Horticulture shall be appointed, the execution of the plan indicated above shall be under the general supervision and control of the Professor of Agriculture, who shall have power to make the necessary contract for under-draining the land—to employ competent laborers for planting the orchards, nursery, hedge and timber belts, and to receive and recommend to the Executive Committee plans for the barn, out-buildings and gardener's house, and upon the approval of such plans the said Professor of Agriculture shall proceed to have said buildings erected.

3. *Resolved*, That Samuel Edwards and O. B. Galusha are hereby authorized to purchase the trees, seeds and nursery stock estimated for in the foregoing report, of

such kinds and in such proportions as they may agree upon, and the Regent is directed to draw warrants upon the Treasurer for the price of such trees, etc., upon their order.

4. *Resolved*, That the sum of $10,000, to be paid out of the appropriation made by the Legislature, be appropriated for the purpose of carrying the foregoing resolutions into effect, to be expended for the various objects set forth in this report, as far as may be necessary.

5. *Resolved*, That the Professor of Agriculture select and receive, this spring, from the nursery of M. L. Dunlap, stock to the amount of the balance due from him, provided he shall find there such trees and plants as will answer our purposes.

A. M. BROWN, *Chairman.*

After discussion the Committee on Horticulture offered the following substitute to third resolution, contained in their report:

Resolved, That the Professor of Agriculture, advising with the chairman of Committee on Horticulture, be authorized, etc. [See report resolution 3.]

And further recommend to amend the resolution appropriating $10,000 for Horticultural Department by increasing item for gardener's house to $850, and decreasing item for draining to $1,750, and recommended the passage of resolutions, as amended.

Which substitute and amendment were made a part of the report.

On motion the Board adjourned to 2 o'clock P. M.

THIRD DAY—THURSDAY, MARCH 11, 1869.

Board called to order at 2:30 P. M., Dr. KILE in the chair.

Mr. LAWRENCE made report in relation to a bill presented by Dr. WARDER.

Mr. DUNLAP made report for Military Committee on Uniforms, etc.

Mr. GOLTRA moved to strike out blue and insert gray. Motion on adoption of resolution lost.

Moved, that the following addition to rule 4, of the by-laws of this Board [page 86], be adopted.

ADDITION TO RULE 4, PAGE 86 OF FIRST ANNUAL REPORT.

That hereafter no student shall be required to provide himself with a military dress for the first term of his attendance. That there be set apart for the purpose of procuring buttons, and the letters I. I. U., to be enclosed in a suitable metalic wreath for the caps, the sum of fifty dollars, which shall be placed in the hands of the book-keeper, who shall procure a supply of these buttons and letters under the direction of the Faculty, and the said book-keeper shall sell the same at cost to the students or other persons for the purpose herein contemplated, in such lots as they

may need. He shall be charged with the fifty dollars, and have credit for the sums received and buttons on hand. It shall be his duty, out of this fund, to keep a supply of buttons, letters and wreaths on hand to meet the demand.

Resolved, That fifty dollars be appropriated out of the library fund for the purchase of buttons and letters required for the military uniform, to be expended as provided in the resolution adopted by the Board and referred to the Committee.

This addition to rule 4, of the by-laws, was adopted.

The special order of the hour being the resolution of Mr. Edward in relation to admission of female students,

On motion of Mr. GRIGGS, it was voted to lay it on the table.

Ayes and nays being called for, the vote counted as follows:

Ayes—Messrs. Allen, Brown of Pulaski, Burchard, Burroughs, Cobb, Pearson, Goltra, Griggs, Lawrence, Mahan, Kile, Pullen, Slade, Van Osdel and the Regent—15.

Nays—Messrs. Blackburn, Dunlap, Edwards, Gulusha, Pickrell, Wright—6.

The report of Committee on the Mechanical Department, to whom Prof. Stuart's communication in regard to regulations for the laboratory was referred, was read.

REPORT OF COMMITTEE.

The Committee on Mechanical Department to whom was referred a communication of Prof. Stuart, beg leave to report.

1st. That each student of analytical chemistry shall, before commencing work in the laboratory, deposit with the Treasurer or his representative, a sum of money equal to the average expense, for use of chemicals and wear and depreciation of apparatus in the hand of such student.

2d. That for a course of two hours daily (except Saturdays) during a term of 12 weeks the sum deposited shall be $12—for a course of four hours daily, the sum deposited shall be $24, and for a course of six hours daily, the deposit shall be $36.

3d. That an account shall be kept by the Professor of Chemistry with each student, in which all the items furnished such student shall be recorded, with charges of cost of same; and the account shall be closed the day before the first day of the examinations at the end of the term, when a settlement shall be made.

4th. That a student who shall use the apparatus belonging to the laboratory and who shall wish to return the same at the end of the term, shall be permitted to do so, provided the apparatus be returned in good condition, and provided also a sum equal to 20 per cent. or its value when received be allowed for the use of the same, such per centage not to exceed $3 00 for the term.

5th. Students shall pay the value of the apparatus broken or destroyed by them individually.

6th. A scale of prices shall be established for the chemicals, or reagents used by students, and the prices to be the cost of the same as paid by the University.

7th. All moneys received from students for chemicals and apparatus shall constitute a distinct fund, from which the Professor of Chemistry may draw to purchase supplies from time to time, as occasion may require.

8th. That proper regulations may be established for the government of the students, while working in the laboratory. And a penalty may be fixed for the violation of any such rules proportioned to the magnitude of the offence, the penalties not less than five or more than twenty cents for the violation of any one rule so established, and posted in a conspicuous place in the laboratory.

9th. As it will be desirable for the Professor to have chemicals for the analysis of soils, plants, grains, etc., made outside of the regular work of the students, and as there will be much wear and tear, and depreciation of apparatus in general use, not chargeable to the students, and as extensions and additions to the laboratory is contemplated and necessary, therefore

Resolved, That the sum of five hundred dollars be appropriated for the purpose as set forth in the ninth section of this report.

Resolved, That the charges, rules and regulations for students in Analytical Chemistry, as set forth in the above report, be adopted.

JOHN M. VAN OSDEL,
Chairman of Committee on Mechanical Department.

On motion, the ninth resolution was stricken out and the report was then adopted as amended.

Mr. PICKRELL offered the following:

Resolved, That the Committee on By-Laws be instructed to prepare a set of laws and rules for the guidance of the Faculty.

Adopted.

Mr. ALLEN offered the following preamble and resolution:

Mr. Jonathan Periam, our late Head Farmer, having resigned his position in connection with the Board,

Resolved, That we regret the loss of his valuable services and ripe experience at this juncture of our history,

And resolved, That we are gratified to learn of his appointment to a position where he may be eminently useful in developing one of the new Agricultural enterprises of the State.

Carried.

Mr. BLACKBURN offered the following resolution:

Resolved, That the Board embrace the occasion of the re-election of Dr. J. M. Gregory, as Regent of this University, to renew to him their oft-expressed assurances of continued confidence and respect, and to congratulate him on his almost unanimous re-election to the place he has filled for the closing term of two years with so much credit to himself, advantage to our rising institution and the great interests of the laboring and industrial classes, and that we hereby vindicate this institution, its officers and faculty, against the charge of wresting it from its primary and normal design, and from all bitter and unfounded charges made and put in circulation against it.

Mr. DUNLAP moved that it lie on the table.

Lost.

Vote upon the original resolution carried.

Mr. EDWARDS moved to take the resolution from the table in reference to the number of Trustees.

Ayes and nays being called for, his motion was withdrawn.

The report of the Committee on Faculty and Course of Study was then read:

REPORT.

The Committee on Faculty and Course of Study recommend that—

1st. The labor system to be continued as an important and valuable feature of practical education, and that the maximum rate of wages be fixed at twelve and one-half cents an hour, and that the hours of labor shall not be less than one and not more than three per day for five days each week, the amount to be determined by the Faculty, who may also excuse any student from the labor for cause. [Amended: *Provided*, that all labor shall be voluntary.]

2d. That the hours of labor and the wages of the several students shall be determined monthly, by the Faculty, and paid by the Regent from the funds of the department for which the labor has been performed, provided that the Faculty may impose a forfeiture of wages for willful absence from labor, or for negligence or unfaithfulness at work.

3d. That the labor shall be conducted with a steady aim to the practical education of the students and shall, as far as possible, coincide with and illustrate their several courses and studies.

The committee also recommend:

4th. That whereas the honorary scholarship provided for by the law is restricted to descendants of soldiers or seamen who served in the army or navy of the United States, there shall be offered by the Trustees one free or honorary scholarship to each county in this State, to be awarded to the student who shall pass the best examination for admission, and who shall agree to pursue one of the industrial courses of study.

5th. That graduates of other colleges desiring to pursue any special branch of study here, be received as resident graduates, on the payment of the usual fees except the matriculation.

6th. Whereas, in the early commencement and organization of the work of committees of this Board, it seemed necessary that the Regent of the University should be placed upon said committees and assume responsibilities which properly belong to the heads of other departments, therefore,

Resolved, That the Regent, at his request, be excused from active service on committees, except the Executive Committee and Committee on Faculty and Course of Study, and that each department be held responsible to this Board for the manner in which it shall discharge its duties; the Regent, as the executive officer of this Board, holding the head of each department to a rigid accountability for the same.

Signed, J. M. GREGORY,
Chairman.

Mr. DUNLAP moved to amend by inserting at the end of section one:

"*Provided*, That all labor shall be voluntary."

The report was then adopted with the amendment.

Mr. PICKRELL moved that the State appropriation made for farms of the University, be appropriated, to be expended under the direction of the Professor of Agriculture and the Farm Committee.

Accepted and referred to the Executive Committee.

The report of the Committee on Buildings and Grounds was received and adopted.

REPORT.

Your Committee on Buildings and Grounds, to whom was referred that part of the Regent's report, which relates to repairs and improvement of the University buildings, beg leave to report that a new roof of tin work should be put on the main building the estimated cost of which would be $850.

They also recommend a cast iron water table around the entire main and wing building on the offset in the brick work at the top of the basement stones, cost about $250. Also, the cornices and cupola of main building should be painted; cost, about $75.

Also, that painting of the entire brick wall of the University building would prevent the absorption of moisture and much improve the appearance of the building; the cost of painting the entire walls, $1,000.

They recommend the sidewalk to the Springfield road, about 900 feet on west side of University grounds; cost of sidewalk, $250.

They also recommend the walls of corridors or passages in the University building to be painted five feet high, two coats; cost about $150.

SYNOPSIS.

1.	Roof on main building	$850
2.	Cast iron water table	250
3.	Painting cornices and cupola	75
4.	Painting brick walls	1000
5.	Sidewalk	250
6.	Painting corridors	150
	Total	$2575

M. C. GOLTRA,
Chairman.

Report of Committee on Mechanical Department, was read and adopted:

REPORT.

Your committee, to whom was referred that part of the Regent's report relating to the Mechanical Department, beg leave to report, that suitable draw-

ing tables, drawing boards, T squares, and instruments, should be provided, and instruction given in geometrical drawing applicable to the science of architecture and the mechanic arts, also the application of the theories of mechanical forces and the strength of material, illustrated by models and experiments.

We also recommend the employment of a suitable Professor, to teach the science of Architectural and Mechanical Drawing, before the commencement of the fall term.

We also recommend the enlargement of the workshops by removal of the stalls, so that a larger number of the students may be employed in carpentry and the practical construction of implements and machinery. For the use of the students engaged in this department, we recommend that suitable tools be obtained, provided the cost of such tables, boards, instruments and tools shall not exceed in the aggregate $500.

Respectfully submitted,

JOHN M. VAN OSDEL,
Chairman.

The Committee on Library and Cabinets, reported back as follows:

REPORT.

The Committee on Library and Cabinets, to whom was referred so much of the Regent's report as relates to library and cabinets, and to communications referred to in that connection, report the following resolutions:

1. *Resolved*, That the offer of Professor Burrill, to give six weeks of the summer vacation to making collections in Natural History in this State, be accepted, and that he be authorized to take with him such members of his class as may volunteer to accompany him, not exceeding five.

2. *Resolved*, That he be permitted to organize and conduct such short excursions for this purpose during term time as he and the Faculty may agree upon, provided that the same shall not interfere with the regular work and study of the term.

3. *Resolved*, That there be appropriated for such excursions and summer service the sum of $300, to be expended for two (2) wall tents, eight (8) rubber blankets, ten (10) woolen blankets, one (1) oil burning stove and furniture, taxidermal instruments, nets, boxes, cans, bags, ammunition, paper and other materials needed and to be used in collecting and preserving specimens, and for provisions for the party.

4. *Resolved*, That Professor Burrill be requested also to give such attention to the agricultural, fruit-growing and mechanical interests and enterprises of the sections he may visit, as he shall find practicable, and secure such specimens of seeds, soils, grasses, etc., as may serve to illustrate the Agriculture of the State, and that for this end we heartily recommend him to the favor of the Agriculturist and Manufacturers of the State.

5. *Resolved*, That the sum of $100 is hereby appropriated for the purchase of a set of meteorological instruments, and that the Faculty be instructed to provide at once for taking and recording regular meteorological observations.

6. *Resolved*, That the chairman of the committee on Library and Cabinets, in connection with Prof. Burrill, be a special committee to secure and remove the cabinets due us from Prof. Powell.

7. *Resolved*, That there be appropriated, during this year, out of the State appropriations and other funds,

For Library	$2500 00
For Chemical Laboratory and chemicals	2500 00
For Philosophical and other apparatus	1250 00
For Cabinets and Cases	1250 00
	$7500 00

All of which is respectfully submitted,

J. M. GREGORY,
I. S. MAHAN,
LEMUEL ALLEN,
JAMES P. SLADE.

Dr. KILE moved to strike out the $300 appropriated for botanical excursions.

Ayes and nays being called for, resulted in 3 ayes, 17 nays.

Ayes—Messrs. Blackburn, Pearson and Kile—3.

Nays—Messrs. Allen, Brown of Pulaski, Burchard, Burroughs, Cobb, Dunlap, Edwards, Galusha, Goltra, Griggs, Lawrence, Pickrell, Pullen, Slade, Wright, Van Osdel, the Regent—17.

The report and resolutions were then adopted.

A report was offered proposing certain changes in regard to rules of tuition, which report did not come to the hands of the secretary, but the following substitute was offered:

Resolved, That tuition be free to students who pursue studies exclusively in the Agricultural, Polytechnic and Military Departments, and that the tuition to students in other departments, or who pursue other scientific or classical studies, remain as already fixed by the Board. This provision to take effect at the commencement of the next collegiate year.

The question on the substitute was carried.

The Committee to whom was referred the matter of re-imbursement of Dr. Gregory for moneys expended by him in purchase of two lots for the University, reported back in favor of buying said lots.

The report of Special Committee, in relation to errors on account, was accepted and adopted.

REPORT.

Your Committee, to whom was referred the resolution of Mr. Dunlap, in regard to instructing the Finance Committee in relation to errors in books, beg leave to report that they have had the same under consideration and make the following statement:

We find, on page 117, First Annual Report, an order dated July 10th, 1867, to J. O. Cunningham, for the sum of $7,278 50 for the purchase of lands, and on page 140, Report of Executive Committee.

"Mr. COBB moved that the Regent and Dr. Scroggs be a Committee to negotiate with McKinley and Burnham for forty acres of land lying between the horse railroad and the 160 acres tract, at a price not exceeding $180 per acre, also to negotiate for the two lots lying between the Springfield road and horse railroad, also to obtain offers for the Griggs' farm or some part thereof, and report at the next meeting of the Executive Committee.

Motion carried."

We are unable to find any further record on the subject.

We are satisfied that said warrant was paid for the land and lots, as stated in the motion of Mr. Cobb, and we have no doubt that the error is in the printed record of the Executive Committee; therefore

Resolved, That said report be so amended as to show that the purchase of said land was made on the authority of the Committee by said J. O. Cunningham, and that the said warrant was duly drawn for that purpose.

M. C. DUNLAP,
H. C. BURCHARD,
E. COBB.

Mr. DUNLAP moved that Professors T. J. Burrill and S. W. Shattuck be paid $1,500 per annum, from March 1st, 1869.

Carried.

An additional report of the Committee on Faculty and Course of Study was then submitted:

REPORT.

The Committee on Faculty and Course of Study further recommend that the suggestions of the Regent in respect to an increase of the Faculty be concurred in.

Also, that Prof. W. F. Bliss be re-appointed to the chair of Agriculture.

Carried.

On motion of Mr. BURCHARD, it was

Resolved, That the Corresponding Secretary be allowed the sum of two hundred ($200) dollars for services during the past year, and a warrant drawn in his favor for that sum.

On motion, it was voted that the Committee on By-laws be instructed to report to the next meeting of the Board an amendment to the by-law relating to the number requisite to change the by-laws; also, to that relating to the payment of Professors' salaries, substituting monthly instead of quarterly, and that, in the meantime, the Regent be authorized to draw warrants for the payments of Professors' salaries monthly.

On motion of Mr. BURCHARD, it was

Resolved, That the Treasurer be allowed for salary, during the past year, the sum of five hundred dollars ($500), and a warrant drawn in his favor for that amount.

Mr. GALUSHA introduced the following resolution:

Resolved, That the Committee on Faculty and Course of Study be and they are hereby instructed so to re-arrange the course of study to be pursued in this institution that they shall consist of,

1. A course in Agriculture, having branch courses in Animal Husbandry, in Horticulture and Gardening.

2. A course in Mechanics, which shall be so varied as to embrace instruction in those branches of study which are relating to the leading mechanic arts.

3. They shall provide for the instruction of students in Military Tactics.

4. They shall provide for teaching of such other scientific and classical studies as are legitimate and desirable in an industrial institution, provided any five or more students in the University shall wish to pursue them.

On motion of Mr. GRIGGS, it was referred to Committee on Faculty and Course of Study.

The Auditing Committee then made the following additional report:

Bill of Wall's Colliery Coal Mining Company, Feb. 18th, March 10th, for two cars coal, $40; to be paid by a warrant in the usual form.

Which was adopted.

On motion of Dr. GREGORY, a special committee of three on the Chemical Department was appointed.

The committee consisted of Messrs. Griggs, Cunningham, Dunlap.

The Committee on regulations for the University reported as follows:

REGULATIONS OF THE UNIVERSITY.

§ 1. The government of the Illinois Industrial University shall be and is hereby committed to the Regent and Faculty, who shall, as soon as possible, prepare a system of rules for the proper government of the students, and maintenance of order in the University, and, from time to time, such additional rules as may be found necessary, and shall submit the same for approval to this Board or the Executive Committee; but such rules shall be in force on the authority of the Faculty until they can be approved by the Trustees.

§ 2. The Faculty shall meet statedly at such times as they shall appoint for the transaction of business pertaining to the management of the internal affairs of the University; and all questions coming before such meetings shall

be determined by the votes of a majority of the members, with the concurrence of the Regent.

§ 3. It shall be the duty of the Regent, as the executive officer of the University, to enforce the regulations of Trustees and Faculty for the maintenance of discipline and order, and to this end, the students of the University shall be subject to his authority, and when the Faculty is not in session, shall be liable to be called to account by him for any violation of rules or orders, to be suspended or otherwise punished at his discretions; but all such acts of the Regent shall be in force only until the next meeting of the Faculty, to which they shall be submitted for final action.

§ 4. Each Professor shall have authority to control students in his own class-room, and at his discretion to suspend or otherwise punish students for any violations of the order of his class, until the next meeting of the Faculty. It shall also be the duty of each Professor to exercise his personal authority at all times to maintain order among the students of the University, and promptly to report to the Regent cases requiring special discipline.

§ 5. Each Professor in charge of a department of instruction in this University shall be held responsible to the Board of Trustees for the faithful and efficient carrying out of the requirements of his department, the adoption of the best methods of instruction and government, and the best text-books and apparatus. He is also charged with the duty of procuring, on consultation with the Regent, and within the limits of the appropriations made for the purpose, the necessary instruments and materials of illustration for his department, and the proper care and preservation of the same. All purchases thus made shall, before put in use, be reported to the book-keeper, and be entered in the inventory of stock, with their cost, and also in the account with the department to which they belong.

§ 6. The Regent shall have general supervision over all the departments of instruction, and shall carefully examine the manner in which each is conducted, consult freely with the Professors in charge, and report to this Board the condition and wants of each.

§ 7. In case of the absence of the Regent of the University, a member of the Faculty, to be, from time to time, designated by the Trustees on the nomination of the Regent, shall act in his place as presiding officer for the administration of the affairs of the University.

The regulations were adopted.

The following resolution, offered by Mr. PICKRELL, was voted:

Resolved, That this Board tender their thanks to the publishers of the Champaign County Gazette, for papers furnished at this meeting.

Dr. GREGORY offered the following resolution, which was adopted:

Resolved, That the thanks of this Board be tendered to the several parties that have made valuable donations to the University.

On motion of JUDGE BROWN, it was voted that Mr. Thomas Franks be and is hereby appointed Gardener to the University, and that his salary be fixed at $75 per month.

On motion of Mr. ALLEN, it was

Resolved, That the thanks of this Board be tendered to the Agricultural and Daily Press for the reports of the proceedings of the meeting of this Board.

The report of the Finance Committee was then read and received:

REPORT.

Your Committee on Finances would ask the Board to make the following appropriations for the current expenses of the year, and that warrants may be drawn to meet the same.

APPROPRIATIONS FOR THE CURRENT YEAR.

1.	University Building	$2,575
2.	Mechanical Department	500
3.	Military Department (purchase of buttons)	50
4.	Agricultural Department	3,000
5.	Purchase of two lots	435
6.	Treasurer and Corresponding Secretary's salary	700
7.	Taxes on lands	1,200
8.	Board Meetings	1,000
9.	Salaries	21,544
10.	Students' Labor	1,500
11.	Fuel and lights	500
12.	Cabinets (Geological and Botanical Excursion)	300
13.	Meteorological Instruments	100
14.	Stationery and Printing	150
15.	University grounds	1,000
16.	Incidental Expenses	1,500
	Total	$36,044

The receipts for the next year are estimated as follows:

Balance on hand	$9000
Interest on Champaign county bonds	10,000
" Morgan " "	2,500
" Sangamon " "	4,500
" Illinois 6 per cent. "	6,540
" Chicago Water "	1,750
Farm produce on hand to be sold	1,500
Probable receipts from matriculation and other fees	1,800
Proceeds of Farm for one year	8,000
Rent of lands	1,500
Total receipts	$33,990

This we respectfully submit as the estimate of receipts and expenditures for the next year, and recommend the adoption of the following:

Resolved, That the Regent be authorized to draw warrants, from time to time, to meet the expenditures for the above objects, not to exceed the amount hereby appropriated for each.

J. H. PICKRELL,
C. R. GRIGGS,
E. COBB,
H. C. BURCHARD.

On motion, the report was adopted.

The Auditing Committee then submitted the following report:

REPORT.

The Auditing Committee beg leave to further report, that they have examined the following bills, find them correct, and recommend that the Regent be ordered to draw warrants for their payment:

Trevett & Green, hardware	$15 67
J. V. Peterson, stationery	20 90
A. P. S. Stuart, chemicals	23 81
J. M. Gregory, petty expenses	73 72
C. G. Larned & Co., stoves and repairs	71 90

The bill of Dr. Warder your committee report back, with the recommendation that it be referred to the Executive Committee.

We also recommend the adoption of the following resolution:

Resolved, That all parties dealing with the University be instructed to make no bill against the same; but upon a written order from the proper person, which order shall be presented with the bills as vouchers therefore.

L. W. LAWRENCE,
JNO. M. PEARSON,
M. L. DUNLAP,
O. B. GALUSHA.

The report and resolution were, on motion, adopted.

On motion of JUDGE BROWN, the Treasurer and Chairman of Finance Committee, were authorized to convert Champaign county bonds to meet any deficiency reported by the Finance Committee, or such deficiencies as may occur.

Carried.

Moved and seconded, that the Board stand adjourned.

Carried.

J. M. GREGORY,
Chairman.

JONATHAN PERIAM,
Recording Secretary.

The following "Statement of Warrants drawn by the Regent" should have appeared after the Regent's Report, on page 70, but did not reach the printer in time.

Statement of Warrants drawn by the Regent.

No.	To whom.	Date.	Object.	Amount.
		1868.		
1	O. B. Galusha	March 12..	Services as Recording Secretary	$325 00
2	Thos. Quick	" 12..	Expense to Board meeting	24 55
3	B. Pullen	" 12..	" "	18 40
4	L. S. Mahan	" 12..	" "	20 15
5	O. B. Galusha	" 12..	" "	26 10
6	L. R. McMurry	" 12..	" "	12 50
7	W. C. Flagg	" 12..	Salary as Corresponding Secretary	100 00
8	W. C. Flagg	" 12..	Expenses as Corresponding Secretary	39 80
9	Thos. Quick	" 12..	1 span of horses	384 00
10	G. W. Atherton	" 14..	Salary, February	166 67
11	H. C. Stewart	" 16..	1 span horses	300 00
12	Lemuel Allen	" 16..	Expenses to Board meeting	22 40
13	J. H. Pickrell	" 16..	" "	12 10
14	A. Blackburn	" 16..	" "	27 20
15	J. S. Johnson	" 16..	" "	44 60
16	J. C. Burroughs	" 16..	" "	34 50
17	A. B. McConnell	" 16..	" "	13 25
18	Emory Cobb	" 16..	" "	49 80
19	E. Cobb	" 16..		107 50
20	J. W. Bunn	" 18..	Services as Treasurer	600 00
21	W. S. Hall & Co	" 18..	Blank books and Stationery	56 62
22	J. M. Gregory	" 18..	Balance of Library expenses	18 67
23	Jos. McCorkle	" 19..	Hardware	29 21
24	Flynn & Scroggs	" 19..	Printing and advertising	48 50
25	Jonathan Periam	" 19..	Harness and farm expenses	127 10
26	G. K. Hosford	" 19..	Spittoons and lamps	6 85
27	Dodson & Hodges	" 19..	Hardware	79 29
28	F. Porter Thayer & Co	" 19..	15 doz. chairs	186 00
29	C. G. Larned & Co	" 19..	Stoves and pipes	63 60
30	W. C. Flagg	" 19..	Expense to Board meeting	21 45
31	Fuller, Warrant & Co	" 19..	1 cook stove, etc	110 50
32	L. C. Garwood	" 21..	1 eight day clock	36 00
33	S. F. Percival	" 24	5 tons hay	85 00
33½	Walker Bros	" 24..	Lumber and tables	218 82
34	Palmer, Fuller & Co	" 24..	20 hot-bed sash	74 50
35	Hubbard & Herrick	" 24..	Hardware	12 40
36	Prairie Farmer Company	" 24..	Circulars and advertising	107 25
37	J. W. Scroggs	" 24..	Service as Secretary Executive Committee	15 00
38	Hibbard & Finch	" 26..	1 wagon, 5 bush. wheat, 3 bags, 2 collars	196 05
39	C. H. Dolton	" 28.	Seed potatoes	25 10
40	Hovey & Nichols	" 28..	Grass seed and peas	59 91
41	Hamar & Green	" 30..	Hardware	120 92
42	C. Scribner & Co	" 30..	Maps and globe	135 65
43	Jackson Burt	" 30..	5 bush. seed wheat	12 50
44	M. L. Dunlap	" 31..	Expense at Board meetings	7 50
45	G. L. Hessell	" 31..	Harness	67 10
46	F. D. Rosford	" 31..	24 bush. potatoes	32 40
47	W. A. Baker	April 3..	Salary for March	166 67
48	Jonathan Periam	" 4..	Salary for 1st quarter	375 00
49	Jonathan Periam	" 4..	Board of men and seeds	60 00
50	Robert Rolston	" 4..	3 months' work on farm	60 00
51	Fred. Finder	" 4.	" "	60 00
52	N. J. Swayze	" 4..	Plan for portico	20 00
53	G. W. Atherton	" 8..	Salary for March	166 67
54	J. M. Gregory	" 14..	" "	338 33
55	Elisha Eldred	" 14..	10,000 feet fencing	180 00
56	M. C. Goltra	" 28..	Locating land scrip	200 00
57	M. C. Goltra	" 28..	Expense at Board meeting	17 05
58	A. M. Griswold	" 29..	1 post augur	4 00
59	Cormish & Cook	" 29..	3 horse whiffletrees, etc	19 00
60	J. Riehl	" 29..	10 bush. seed oats	7 50
61	James Braddock	" 29..	1 month's work on farm	20 00
62	Geo. Limberger	" 29..	3 horses, 1 wagon, 1 harness	400 00
63	H. N. F. Lewis	" 29.	Advertising in Western Rural	39 60
64	Aaron Potter	" 29..	Services as clerk and librarian	100 00

Statement—Continued.

No.	To whom.	Date.	Object.	Amount
		1868.		
65	G. H. Anderson	May 1	Interest on warrant 84, of 1867	$20 ..
66	W. A. Baker	" 1	Salary for April	166 66
67	J. S. Searfoss	" 2	Wages for April	83 07
68	H. Dunlap	" 4	5000 strawberry plants	25 ..
69	J. W. Bartman	" 5	1 load of wood	2 75
70	Fuller, Finch & Fuller	" 5	1 barrel linseed oil	49 58
71	J. M. Gregory	" 6	Pay-roll of students' labor	125 ...
72	Beidler & Kratz	" 12	Lumber	182 73
73	Thomas Quick	" 12	Expense of Executive Committee meeting	16 30
74	I. S. Mahan	" 12	Expense of Executive Committee meeting	16 10
75	J. S. Johnson	" 12	Expense of Executive Committee meeting	25 ..
76	M. C. Goltra	" 12	Expense of Executive Committee meeting	17 ..
77	J. M. Gregory	" 18	University buttons for uniforms	68 75
78	Hall & Peterson	" 18	Books and stationery	18 88
79	Dodson & Hodges	" 18	Hardware	147 80
80	Sam. Houston	" 18	Two days' teaming	8 ..
81	J. Periam	" 13	Farm expenses	140 15
82	J. M. Davies	" 18	Stones and labor	21 70
83	Flynn & Scroggs	" 18	Printing blanks	37 ..
84	J. M. Scroggs	" 18	Salary as Superintendent	101 66
85	A. H. Andrews & Co	" 18	Anatomical plates	30 ..
86	C. G. Larned & Co	" 14	Stoves and pipe	66 ..
87	Adams, Blackmer & Lyon	" 14	1 history chart	6 ..
88	Aaron Potter	" 14	Meals furnished Trustees	10 70
89	Wm. Price	" 14	Paints and painting	413 28
90	Park & Royer	" 14	812 feet posts	7 80
91	Beidler & Kratz	" 14	Lumber account	28 17
92	Hulburd, Herrick & Co	" 14	50 brass keys	3 12
93	J. M. Gregory	" 14	Pay-roll of students' labor	101 13
94	Patrick Lamb	" 14	Wages of Janitor—1 month	37 ..
95	G. W. Atherton	" 16	Salary for April	166 66
96	J. M. Gregory	" 18	" "	333 34
97	J. A. Hutchinson	" 18	Services of jack	10 ..
98	D. J. Ayres	" 18	9 1-4 days work, carpentering	25 44
99	Elisha Eldred	" 23	Lumber for barn, shop and fence	545 37
100	Chas. Sherman	" 30	6 days' work, carpentering	16 50
101	D. G. Ayres	" 30	11 days' work, carpentering	30 25
102	J. W. Powell	" 30	Salary	600 ..
103	Hanson Henry	June 1	2 months, 18 days' work	48 66
104	John S. Davis	" 1	1 month's work	86 ..
105	J. M. Gregory	" 1	Salary for May	338 33
106	A. M. Cheny	" 1	1 day's work, carpentering	2 75
107	W. A. Baker	" 1	Salary for May	166 66
108	S. P. Percival	" 2	Hay and osage orange plants	17 10
109	Fuller, Finch & Fuller	" 2	Glass and white lead	44 18
110	J. S. Searfoss	" 2	Wages for May	83 07
111	Robert Rolston	" 8	2 months' farm work	40 ..
112	Walker, Lapham & Co	" 3	Lumber and work	23 24
113	J. O. Cunningham	" 8	Expense for labor and insurance	179 ..
114	Robert Peacock	" 8	Bill of lumber	86 54
115	S. M. Dunsett	" 4	1½ days plastering	6 ..
116	N. Bateman	" 5	Postage on circulars	14 82
117	G. W. Atherton	" 10	Salary for May	166 66
118	J. M. Gregory	" 11	Pay-roll of students' labor	180 ..
119	Thos. Quick	" 12	Expenses at Board meeting	13 30
120	I. S. Mahan	" 12	" "	15 05
121	B. Pullen	" 12	" "	15 05
122	E. W. Holmes	" 13	Board for farm hands	128 ..
123	Aaron Potter	" 15	Services as librarian and clerk	40 42
124	P. J. Burrill	" 15	Teaching 1-6 of academic year	200 ..
125	F. A. Avey	" 15	Blacksmithing	14 15
126	Elisha Eldred	" 15	Lumber	154 18
127	Angle, Sabin & Co	" 15	Plows	33 50
128	Patrick Lamb	" 15	Wages as Janitor, 1 month	37 ..
129	D. G. Ayres	" 20	12¾ days' work, carpentering	35 06
130	J. Periam	" 23	Boarding farm hands	56 ..
131	Chas. E. Allard	" 23	1 week's wages, farm work	4 70
132	Aaron Potter	" 23	1 week's boarding, farm hand	3 50
133	C. D. Gregory	" 27	Services as accountant	15 ..
134	J. M. Gregory	" 27	Salary for June	333 33
135	J. L. Davis	" 29	1 month's wages, farm work	36 00

Statement—Continued.

No.	To whom.	Date.	Object.	Amount.
		1868.		
136	James Braddock	June 29	2 months' farm work	$40 ..
137	Gammon & Prindle	" 29	1 horse rake	97 ..
138	S. H. Busey	" 30	1 stack hay, for teams	25 ..
139	Hubbard, Herrick & Co	" 30	Locks for University	10 75
140	J. N. Wharton	July 4	9¾ days' work carpentering	14 62
141	A. L. Rader	" 4	14 days' work on farm	21 ..
142	Albert Russell	" 4	1½ days' work on farm	2 25
143	Pat. Sullivan	" 5	1 month's work on farm	20 ..
144	Pat. Lynch	" 5	" "	20 ..
145	Fritz Finder	" 5	3 months' work on farm	60 ..
146	Geo. Lauberger	" 5	2 months' work on farm	40 ..
147	Jonathan Periam	" 5	Salary for 2d quarter	375 ..
148	W. A. Baker	" 5	Salary for June	166 67
149	G. W. Atherton	" 5	"	166 67
150	W. H. Crayne	" 5	14¾ days' work on shop	23 12
151	J. S. Searfoss	" 5	Wages for June	80 33
152	J. E. Graham	" 5	10¾ days' work on barn	16 12
153	D. G. Ayres	" 5	5 days' work carpentering	12 75
154	I. C. R. R. Co	" 6	Advanced freight	7 55
155	Fairbanks & Greenleaf	" 10	1 hay scale	100 ..
156	Thomas Franks	" 15	1 month's work, gardener	40 ..
157	Pat. Lamb	" 17	21 days' work on farm	30 ..
158	J. S. Davis	" 18	18 days' work on farm	90 90
159	J. M. Gregory	" 18	Bill of Ritchie & Son for philosophical apparatus	504 50
160	Fuller, Finch & Fuller	" 18	1 barrel linseed oil	49 86
161	J. E. Graham	" 24	15 days' work carpentering	23 50
162	W. H. Crayne	" 24	9 days' work carpentering	13 50
163	J. M. Gregory	" 25	Salary for July	333 33
164	D. G. Ayres	" 27	14¼ days' work carpentering	30 19
165	G. W. Holmes	" 30	Boarding farm hands	28 69
166	G. W. Atherton	Aug. 1	Salary for July	166 66
167	Wm. A. Baker	" 1	"	166 66
168	Trevett & Rupert	" 1	Hardware	51 71
169	S. J Searfoss	" 6	Wages for July	88 33
170	Champaign Union Gazette	" 6	Printing and advertising	12 50
171	D. G. Ayres	" 7	6 days' work carpentering	16 50
172	Jonathan Periam	" 10	Farm expenses	272 50
173	½] James Lynch	" 10	1 month's wages on farm	35 ..
174	John Kinney	" 10	" "	35 ..
175	Hamar & Green	" 11	Hardware	18 83
176	J. M. Gregory	" 11	Salary for August	333 33
177	Journal Company	" 14	Advertising and printing	163 75
178	Dodson & Hodges	" 14	Tinning roof	609 91
179	Patrick Lamb	" 25	1 month's wages, Janitor	37 ..
180	Thos. Franks	" 25	1 month's work, less 1½ days	36 15
181	F. M. & A. Avey	" 25	Blacksmithing	24 ..
182	American Express Company	" 25	Expense on books from Washington	9 50
183	Geo. W. Holmes	" 26	Boarding farm hands	68 ..
184	James Braddock	" 26	2 months' farm work	40 ..
185	Pat. Lynch	" 31	1 month's farm work	20 ..
186	James Lynch	" 31	Labor on farm	29 25
187	Geo. W. Atherton	" 31	Salary for August	166 67
188	Wm. A. Baker	" 31	"	166 67
189	Wm. P. Sweet	Sept. 4	Lightning rods	41 15
190	J. S. Searfoss	" 4	Wages for August	88 34
191	Bord & Chandler	" 5	Engraving of college	35 30
192	Hovey & Nichols	" 5	Garden shears and border cutter	9 ..
193	Geo. Landberger	" 7	2 months' farm work	40 ..
194	Elisha Eldrid	" 8	195 feet moulding	6 24
195	Fritz Finder	" 9	2 months' farm work	40 ..
196	John Kinney	" 12	1½ months' farm work	46 66
197	½] A. L. Rader	" 14	3¾ days' work on grounds	5 62
198	Mrs. Mary Coffey	" 15	4 7-10 days' cleaning	7 05
199	Thomas Franks	" 15	1 month's wages	40 ..
200	B. Pullen	" 16	Expenses at Board meeting	19 70
201	I. S. Mahan	" 16	" "	20 45
202	Thomas Quick	" 16	" "	27 05
203	J. M. Van Osdel	" 16	Expenses at 4 meetings	70 ..
204	G. N. Richards	" 18	Printing circulars	35 50
205	J. M. Gregory	" 18	Sundry expenses for labor, etc	23 50
206	Elisha Eldred	" 18	Lumber for fence and tank	80 ..
207	Hibbard & Finch	" 18	Tools for farm	223 60
208	Church, Goodman & Donelly	" 18	Printing circulars	154 74
209	Pat. Sullivan	" 18	2 months' work on farm	40 ..

Statement—Continued.

No.	To whom.	Date.	Object.	Amount.
		1868.		
298	Pat. Lamb	Sept. 18	1 month's wages as Janitor	$37 ..
299	James Braddock	" 18	1 month's, 2 days' farm work	21 38
300	Jonathan Periam	" 19	Boarding farm hands	48 ..
301	J. M. Gregory	" 22	Salary for September	333 33
302	O. O. Alexander	" 22	Recording deeds	6 75
303	L. C. R. R. Co.	" 22	Back charges on freight	14 82
304	Porter & Thayer	" 25	6 dozen chairs	51 50
305	Root & Cady	" 25	2 drums, 2 fifes	35
306	W. F. Bliss	" 25	Salary for September	166 66
307	J. M. Gregory	" 28	Books for library	600 ..
308	L. C. R. R. Co.	" 28	Back charges of freight	5 10
309	W. A. Baker	" 30	Salary for September	166 67
310	George W. Atherton	" 30	" "	166 67
311	A. P. S. Stuart	" 30	" "	166 67
312	Thomas J. Burrill	" 30	" "	100 ..
313	S. W. Shattuck	" 30	" "	100 ..
314	Jonathan Periam	" 30	Salary for 3d quarter	375 ..
315	Edward Snyder	" 30	Salary for September	83 34
316	J. S. Searfoss	" 30	Wages for September	83 33
317	American Express Co.	Oct. 13	Expressage on chemicals	9 75
318	R. C. Beach & Co.	" 15	3 tons of coal	17 ..
319	Thomas Franks	" 15	Wages for September	50 ..
320	Hovey & Nichols	" 15	Flower pots	23 71
321	M. & L. Gurley	" 16	Engineering instruments	234 80
322	J. M. Gregory	" 16	Pay-roll of students' work	180 ..
323	E. S. Ritchie & Son	" 16	Philosophical and chemical apparatus	186 26
324	S. R. Walker	" 17	3000 brick for hot-house	30 ..
325	Patrick Lamb	" 17	1 month's services as Janitor	37 ..
326	J. M. Gregory	" 17	Balance of students' pay-roll of labor	13 90
327	Halburd & Herrick	" 17	1 bell	9 ..
328	Wm. Price	" 19	Painting and paints	119 59
329	McKinzie & Bowman	" 19	3 cubic yards' sand	3 ..
330	Dodson & Hodges	" 19	Hardware	59 12
331	James Vick	" 20	2 barrels onions	30 ..
332	Skinner, Briggs & Co.	" 20	1 gang plow	48 ..
333	Palmer, Fuller & Co.	" 20	10 boxes of glass—8x10—for hot-house	42 50
334	J. M. Gregory	" 20	Purchase of microscope	69 ..
335	Patrick Lynch	" 20	2 months' work on farm	40 ..
336	Patrick Sullivan	" 21	1 " "	20 ..
337	J. M. Gregory	" 21	Salary for October	333 33
338	George Stipe	" 22	1 month's work on farm	20 .
339	McKinzie & Bowman	" 26	Gravel for walks	35 ..
340	Wells, Coll Coal Co	" 27	1 car of coal	20 ..
341	J. F. Lahme	" 27	Chemicals and apparatus	433 22
342	George W. Holmes	" 27	Boarding farm hands	43 03
343	F. M. Avey	" 28	Blacksmithing	12 53
344	Prairie Farmer Co.	" 28	Printing 350 circulars	7 50
345	Page & Sprague	" 29	112 pounds putty	6 65
346	Jonathan Periam	" 29	Boarding farm hands	48 ..
347	Holbrook & Parker	" 30	10 tons hard coal	140 ..
348	W. F. Bliss	" 30	Salary for October	166 67
349	L. C. R. R. Co.	" 30	Charges of freight	39 43
350	S. R. Walker	" 31	1200 brick for cistern	12 ..
351	A. P. S. Stuart	" 31	Salary for October	166 67
352	Wm. A. Baker	" 31	" "	166 67
353	S. W. Shattuck	" 31	" "	100 ..
354	J. S. Searfoss	" 31	Wages for October	83 33
355	George W. Atherton	" 31	Salary for October	166 66
356	Thos J. Burrill	" 31	" "	100 ..
357	Edward Snyder	" 31	" "	83 33
358	George Stipe	Nov. 2	Farm work, 2 months' board	50
359	August Shavelan	" 2	1 month's farm work	35 00
360	Fred. Finder	" 2	Farm work to November 1st	62 50
361	E. S. Gurley	" 4	Surveying and draughting instrum'nts	110 65
362	James M. Thorburn	" 5	Bulbs	40 49
363	J. Periam	" 6	Farm expenses	112 21
364	J. McKinzie	" 7	4½ cubic yards sand	4 25
365	W. F. Foot	" 7	3700 bricks	37 ..
366	W. F. Bliss	" 7	Salary for November and December	333 34
367	John Ostfeld	" 8	Repairs of farming tools	25 ..
368	J. M. Gregory	" 9	Balance of account to date	89 12
369	J. Seavey & Co.	" 9	Furnaces for library	447 40
370	Thomas Devore	" 9	Farm work—husking	15 90
371	J. M. Gregory	" 16	Pay-roll of students' labor	248 ..
372	Pat. Lamb	" 16	Wages for November	37 00

Statement—Continued.

No.	To whom.	Date.	Object.	Amount
		1868.		
281	Thos. Franks	Nov. 16	Wages for November	$50
283	Pat. Lynch	" 17	1 month's farm work	20
285	Thos. Quick	" 18	Expense at Board meeting	35
284	J. S. Johnson	" 18	" " "	17
280	O. B. Galusha	" 18	" " "	30
286	B. Pullen	" 18	" " "	25
287	Sam. Edwards	" 19	" " "	53
288	I. S. Mahan	" 19	" " "	10
289	W. Kile	" 20	" " "	5
290	M. C. Goltra	" 20	" " "	11
291	L. M. McMurry	" 20	" " "	11
292	W. C. Flagg	" 20	" " "	41
293	A. M. Brown	" 20	" " "	36
294	H. C. Burchard	" 20	" " "	46
295	J. M. Gregory	" 20	Salary for November	333
297	Skinner, Briggs & Enoch	" 20	Repair of farm tools	8
298	Aaron Potter	" 20	Services as clerk of Treasurer	60
299	H. E. Lapham & Co	" 20	Lumber and lime	50
300	Beidler & Kratz	" 20	Lumber for hot-house	204
301	G. N. Richards	" 20	Printing chemical labels	9
302	E. V. Peterson	" 20	Stationery, etc	11
303	A. Campbell	" 20	Roof repair	10
304	Walker Bros	" 20	Lumber and dressing	58
305	Trevitt & Greene	" 20	Hardware	58
306	Henry Swanell	" 20	Paints and glass	58
307	Joseph McCorkle	" 20	Hardware	172
308	W. C. Flagg	" 24	Expenses at Board meeting	141
8 9	Thos. Devore	" 25	Farm work, husking	15
310	Lemuel Allen	" 25	Expenses at Board meeting	234
311	Ermentrout & Alexander	" 26	269 posts at 12¼ cents	32
312	James M. Rolfe	" 27	Mason work, hot-house and cistern	76
313	L. N. Lawrence	" 27	Expense at Board meeting	34
314	A. Avey	" 28	Blacksmithing	33
315	Prairie Farmer Company	" 28	Advertising	12
316	A. Blackburn	" 28	Expense at Board meeting	166
317	A. P. S. Stuart	" 30	Salary for November	166
318	Geo. W Atherton	" 30	"	166
319	W. A. Baker	" 30	"	100
320	S. W. Shattuck	" 30	"	100
321	Thos. J. Burrill	" 30	"	100
322	E. Snyder	Dec. 1	"	83
323	J. S. Searfoss	" 1	Wages for November	16
324	J. H. Blakesly	" 2	Farm work one month	40
325	Jonathan Perlam	" 2	Boarding farm hands	18
326	J. H. Pickrell	" 3	Expense to Board meeting	10
327	Flynn & Scroggs	" 4	Printing and advertising	30
328	Bullock & Crenshaw	" 6	Chemicals and apparatus	30
329	George Stipe	" 6	1 month's work on farm	30
330	Sam. McKinzie	" 6	Gravel for walks	30
331	Western Rural	" 6	Advertising	40
332	J. S. Busey	" 7	5 cords wood	18
333	J. M. Gregory	" 7	Pay-roll of students' labor	30
334	A. F. Childs	" 8	Drain tile for farm	30
335	J. M. Gregory	" 11	Salary for December	333
336	Pat. Sullivan	" 11	2 months' farm work	60
337	Elisha Eldred	" 11	Lumber bill	30
338	Walls Coll. Co	" 11	2 cars of coal	30
339	Beach & Co	" 15	Balance of coal bill	30
340	Thos. Franks	" 16	Wages for December	50
341	Hulburd & Herrick	" 22	Hardware	30
342	Pat. Lamb	" 22	Wages for December	20
343	G. W. Atherton	" 23	Salary for December	333
344	J. S. Searfoss	" 23	Wages for December	60
345	W. J. Ermentrout	" 23	Insurance	30
346	Pat. Sullivan	" 25	Wages farm-hand, 1 month	30
347	Pat. Lynch	" 25	Farm work, 2 months'	60
348	George Stipe	" 25	Farm work 1 month to December 31st	30
349	Fritz Finder	" 25	Farm work 2 months to December 31st	60
350	Aug. Shavelan	" 25	Farm work 2½ months to Dec. 31st	75
351	J. H. Blakesly	" 25	Farm work 1 month and 3 days	40
352	S. R. Walker	" 26	1500 brick for still	30
353	Prof. W. A. Baker	" 28	Salary for December	333
354	A. P. S. Stuart	" 28	"	166
355	S. W. Shattuck	" 28	"	100
356	T. J. Burrill	" 28	"	100

Statement—Continued.

No.	To whom.	Date.	Object.	Amount.
		1868.		
257	Jonathan Periam	Dec. 28	Salary for last quarter	$375 ..
258	Ed. Snyder	" 28	Salary for December	100 ..
259	J. C. Sheldon	" 28	Insurance on building	50 ..
260	Sherfy & Sweet	" 28	" " "	151 50
261	Sam. Richner	Jan. 6, 1869	Desk for chemical laboratory	26 95
262	H. C. Burchard	" 18	Expressage board meeting	23 70
263	American Express Co	" 18	Expenses on books	15 70
264	Thos. Franks	" 18	Wages University gardener	50 ..
265	Pat. Lamb	" 18	Wages of Janitor	37 ..
266	J. M. Van Osdel	" 21	Expense of board meeting	18 50
267	M. C. Goltra	" 21	" " "	18 10
268	A. F. Childs	" 21	2000 drain tile	120 ..
269	Journal Co	" 21	Printing catalogues	34 ..
270	Wall's Coal Co	" 21	1 car of coal	20 ..
271	N. J. Colman	" 21	Advertising in Rural World	25 ..
272	George K. Hosford	" 21	Lamps and burners	28 15
273	T. M. Avey	" 21	Blacksmithing	11 78
274	J. E. Hessel	" 21	Harness and repair	119 25
275	J. M. Gregory	" 21	Account of petty expense	47 19
276	Hovey & Heffron	" 21	Flower pots for hot house	17 57
277	J. A. Henderson	" 21	1 copper still (chemical laboratory)	14 ..
278	Dr. J. A. Warder	" 26	Salary for lecturing	600 ..
279	J. M. Gregory	" 26	Students' labor—pay-roll	74 ..
280	Jonathan Periam	" 26	Farm expense at University	90 09
281	W. C. Flagg	" 26	Expense course of lectures	283 45
282	M. L. Dunlap	" 26	Expenses at Board meeting	22 75
283	Thos. J. Burrill	" 26	Salary for January	100 ..
284	Holbrook & Parker	" 26	10 tons hard coal for furnace	140 ..
285	Prof. W. A. Baker	" 31	Salary for January	166 66
286	W. F. Bliss	" 31	" " "	166 66
287	A. P. S. Stuart	" 31	" " "	166 66
288	S. W. Shattuck	" 31	" " "	100 ..
289	Ed. Snyder	" 31	" " "	100 ..
290	J. S. Searfoss	" 31	Wages for January	83 33
291	American Express Co.	" 31	Express on books	39 50
292	J. M. Gregory	Feb. 5	Salary for January	333 33
293	Gardner & Co	" 5	4200 pounds hard coal	88 60
294	Walls Coll Co	" 5	1 car of coal	20 ..
295	Fritz Finder	" 7	Wages for January	25 ..
296	J. H. Blakesley	" 7	Wages for January and board	35 ..
297	A. Campbell	" 15	Repairing roof	10 ..
298	Pat. Lamb	" 16	Wages as Janitor	37 ..
299	Mark. Daro	" 23	19 days' work	18 ..
300	J. M. Gregory	" 28	Periodicals for library	164 63
301	W. A. Baker	" 28	Salary for February	166 66
302	W. F. Bliss	" 28	" " "	166 66
303	A. P. S. Stuart	" 28	" " "	166 65
304	S. W. Shattuck	" 28	" " "	100 ..
305	Thos. J. Burrill	" 28	" " "	100 ..
306	Ed. Snyder	" 28	" " "	100 ..
307	J. S. Searfoss	" 28	Wages "	83 33
308	J. M. Gregory	" 28	Salary "	333 33
309	Ed. Snyder	" 28	Pay-roll of students' labor	52 ..
310	Fritz Finder	" 28	Wages for February (farm)	25 ..
311	J. H. Blakesley	" 28	" " "	35 ..
312	Ag. Shavelan	" 28	" " "	25 ..
	Whole amount of warrants drawn			$26,098 02

Classified Statement of Expenditures.

Board expense	$2381
Library	869
Landscrip	219
Salaries	18,000
Chemical apparatus	973
Engineering instruments	845
Philosophical apparatus	504
Fuel, lights, repairs, and all incidental expenses	3175
Improvements and alterations in buildings and grounds	8222
Farm and garden, purchase of teams, wagons, implements, fencing and building of barn, etc., and running expense	7063
Total	$36,098

MINUTES OF MEETINGS OF EXECUTIVE COMMITTEE DURING 1868.

UNIVERSITY BUILDING, *April* 28, 1868.

At a called meeting of the Executive Committee and the Committee on Buildings and Grounds, held at the Industrial University, there were present only the Regent, Messrs. J. O. Cunningham and M. C. Goltra.

No quorum being present, the meeting was adjourned to meet in two weeks from date.

JONATHAN PERIAM, *Secretary.*

UNIVERSITY BUILDING, *May* 12, 1868.

The adjourned meeting of April 28th, was called to order at the office of the Regent, at 9 A. M.

Present—The Regent, Messrs. Cunningham, Goltra, VanOsdel, Mahan, Quick and Cobb. Absent—Messrs. Pullen and Harding. The gentlemen comprising the Committee on Buildings and Grounds were invited to sit with the Executive Committee.

The REGENT was requested to correspond with manufacturers for the purpose of purchasing cloth for uniforms.

The following bills were then audited and allowed, and it was ordered that a warrant be drawn, in favor of the Regent, for their payment:

Waterbury Button Company	$43 75
Waterbury Button Company	20 00
Dodson & Hodges	57 95
Hall & Peterson	18 18

Jonathan Periam		$140 15
Beidler & Kratz		28 17
C. J. Larned & Co		64 15
Samuel Houston		8 00
J. M. Davis		21 70
Flynn & Scroggs		37 00
On motion, Dr. Scroggs was allowed	$186 68	
Off credit	65 00	
Leaving balance due him		101 68
Parke & Rogers		7 80
Wm. Rice		413 25
Hulburd, Herrick & Co		3 12
Labor of students, April, 1868		95 17
N. J. Swarey		20 00
M. L. Dunlap		25 00
S. Riehl		7 50
A. M. Griswold		4 00
J. S. Searfoss		83 34
A. N. J. Lewis		39 60
George Landberger		400 00
James Braddock		20 00
Aaron Potter		20 00
Aaron Potter—freight on his household goods was made free to him.		
M. C. Goltra		842 55
Elisha Eldred		180 00
Charles Dalton		25 00
Union Coal Mining Company		14 00
J. M. Boatman		2 75
Frederick Finder		60 00
Robert Rolston		60 00
Jonathan Periam		127 00
F. D. Rexford		32 40
Hamar & Green		120 92
Hovey & Nichols		59 91
L. Vandersyde		8 25
Jackson Burke		12 50
S. J. Percival		35 00
Williard & Finch		120 00
Palmer, Fuller & Co		74 00
Thomas Quick		384 00
H. C. Stewart		300 00
A. W. Andrews		30 00
Adams, Blackmer & Co		6 00
Aaron Potter		10 70

It was voted that when the Committee adjourned, they should adjourn to meet at the University Building, June 11th, 1868.

It was voted that the Regent and Farm Superintendent be authorized to employ a gardener, and it was also voted that a sum not exceeding $400 be appropriated for repairing farm buildings and fences.

JONATHAN PERIAM, *Secretary.*

UNIVERSITY BUILDING, *June 11th*, 1868

The Executive Committee met at 7 P. M.

Present—Messrs. Quick, Cunningham, Goltra, VanOsdel, Pullen, Cobb, Mahan, and the Regent.

Mr. Periam being absent, I. S. Mahan was chosen Secretary, *pro tempore.*

Voted that the amount of freight charged by I. C. R. R. Co., for the transportation of the Regent's household goods, is hereby donated to the Regent, amounting to $38.

J. O. CUNNINGHAM was appointed a committee to examine the freight accounts of the past year, and report to this Committee.

The REGENT made a verbal report in reference to warrants drawn for labor on grounds, in relation to the expenditure of $1500, and vouchers showing the expenditure of all but $426 55; also vouchers showing payment of the last named $126 55—all of which was referred to the Board of Trustees. The following bills were allowed:

J. M. & A. Avey	$14 15
F. C. Gill & Dodson & Hodges	20 10
J. O. Alexander	6 75
Elisha Eldred	545 37
Fairbanks, Greenleaf & Co	15 20
Hulburd, Herrick & Co	10 75
C. D. Gregory	15 00

On motion of Judge J. O. CUNNINGHAM, the Regent was requested to issue a suitable circular and catalogue for the ensuing year.

The Committee then adjourned to meet again, Friday, June 12th, 1868.

JONATHAN PERIAM, *Secretary.*

FRIDAY, *June 12th*, 1868.

The Committee met at the University, at 9 A. M., and the following bills were allowed:

Robert Rolston	$40 00
S. S. Percival	17 10
Hanson Henry	48 66
S. M. Dunsche	6 00

John L. Davis	$33 00
S. J. Searfoss	83 07
Fuller, Finch & Fuller	49 58
Fuller, Finch & Fuller	44 18
David G. Ayres	25 44
Patrick Lamb	37 00
A. M. Cherry	2 75
Chas. Sherman	16 50
E. W. Holmes	128 00
Elisha Eldred	154 18
Angle & Sabin	33 50

On motion of Judge CUNNINGHAM, the sum of $9 was appropriated for the purchase of a suitable bell.

On motion of EMERY COBB, the Regent and Judge Cunningham were appointed a committee to purchase a suitable bell.

The bill of Aaron Potter was allowed for $61 80.

A motion for an appropriation for the purchase of musical instruments, being made, after discussion, on motion of M. C. GOLTRA, the Regent and Judge Cunningham were appointed a committee to purchase a bass drum, a snare drum and a fife, and to report to the Board of Trustees in relation to the purchase of other instruments.

Professor G. W. Atherton reported a bill for the labor of students, amounting to $180, which, upon motion of EMERY COBB, was allowed.

It was moved by M. C. GOLTRA, and seconded, that the recording Secretary be requested to write to ex-Secretary O. B. Galusha, inquiring after the books and records. Carried.

On motion of I. S. MAHAN, after some discussion, it was

Resoved, That a committee of three be appointed, to inquire into the cost of procuring tile, the propriety of underdraining, and to procure and examine specimens of tile.

Messrs. Quick, Mahan and Periam were so appointed.

The REGENT called attention to the fact that scrip is now selling at over $1 per acre; and asked if some action should not be taken in relation to 75,000 acres now on hand. It was moved by M. C. GOLTRA, and seconded, that 50,000 acres of scrip be sold, with the concurrence of a majority of the Board of Trustees, provided that it be sold at not less than $1 10 per acre. The Finance Committee and Treasurer being authorized to sell upon the written consent of a majority of the Board of Trustees, as above; and consent was accordingly given, in writing, as follows:

The undersigned, Trustees of the Illinois Industrial University, hereby consent and advise the sale of fifty thousand (50,000) acres of scrip, by the financial committee, at not less than one dollar and ten (1 10) cents per acre.

I. S. MAHAN,
B. PULLEN,
J. O. CUNNINGHAM,
M. C. GOLTRA,
EMERY COBB,
J. W. SCROGGS,
THOMAS QUICK.

The following preamble and resolution were then offered by Rev. I. S. MAHAN:

WHEREAS, the Board of Trustees, at the annual meeting in March, 1868, offered a resolution, proposing a revision of the charges for room rent, tuition and incidental expenses, which was, by vote of said board, referred to this committee for its consideration and action; therefore,

Resolved, That hereafter charges for room rent and incidental expenses and tuition be as follows:

Room rent per term, for each student... .....$3 00
Incidental expenses..... 2 50

A matriculation fee of $10 shall be paid by each student upon entering the University, and before being entitled to enter the classes, besides which no charges whatever for tuition shall be made against students: *Provided*, that nothing herein contained shall be so construed as to prevent the Faculty from admitting such indigent students free, to the privileges of the University, as shall, in their judgment, be worthy.

Laid on the table.

On motion, Emery Cobb was added to the committee for examining freight account.

It was moved by Judge CUNNINGHAM, and seconded, that assistant professors be paid not to exceed ($1,200) twelve hundred dollars per annum. Carried.

By Mr. COBB, that the Regent be authorized to draw a warrant for ($200) two hundred dollars, to pay Prof. T. J. Burrill.

A motion to adjourn was carried.

JONATHAN PERIAM,
Secretary.

UNIVERSITY BUILDING, *Sept. 16th*, 1868.

Pursuant to call, the Executive Committee met at the Regent's office at 9 o'clock, A. M.

—**14

Present—Messrs. Quick, Van Osdel, Cunningham, Pullen, Mahan and the Regent.

The following bills were allowed:

E. S. Ritchie & Son	$506 50
Hibbard & Finch	238 40
Elisha Eldred	6 34
A. S. Rader	5 63
J. J. Osfield	25 10
George Sandberger	40 00
Hovey & Nichols	9 00
Dodson & Hodges	669 91
Bord & Chandler	35 80
Mrs. Mary Coffee	7 05
William P. Sweet	41 15
F. M. & A. Avey	24 00
Thomas Franks	40 00
Thomas Franks	40 00
Thomas Franks	36 15
Journal Company	163 75
Hamar & Green	13 83
Rupert & Trevett	51 71
John Kinney	35 00
John Kinney	46 66
D. G. Ayres	16 50
D. G. Ayres	39 19
D. G. Ayres	13 75
J. S. Searfoss	83 33
J. S. Searfoss	83 34
J. S. Searfoss	83 33
James Lynch	35 00
James Lynch	29 35
Patrick Lynch	20 00
Patrick Lynch	20 00
Patrick Lamb	30 00
Patrick Lamb	37 00
Patrick Sullivan	20 00
G. W. Holmes	28 82
G. W. Holmes	68 00
Fritz Finder	60 00
George Sandberger	40 00
J. E. Mayhew	16 12
J. E. Mayhew	22 00
W. H. Crayne	22 13
W. H. Crayne	13 50
J. N. Wharton	14 62
Albert Russell	2 25
James Braddock	40 00
James Braddock	40 00
David G. Ayres	35 06

Chas. E. Allard	4 70
A. L. Rader	21 00
A. Potter	3 50
I. L. Davis	20 90
I. L. Davis	36 00
S. M. Busey	25 00
Fairbanks, Greenleaf & Co	100 00
Gammon & Brindle	27 00
Fuller, Finch & Fuller	49 86
Champaign Union	12 50
N. Bateman	14 82
Jonathan Periam	272 50
Jonathan Periam	56 00
B. C. Beach, referred, with power, to the Regent	6 00
Church, Goodman & Donnelly	154 74
Pat. Lamb	37 00
T. J. Burrill	200 00
G. N. Richards	35 50
Root & Cady	35 00
Thos. Quick	27 65
R. Pullen	19 70
I. S. Mahan	20 45

It was moved and seconded that ($368 69) three hundred and sixty-eight dollars and sixty-nine cents be appropriated for chemicals; and it was moved that ($439 45) four hundred and thirty-nine dollars and forty-five cents be appropriated for chemical apparatus. Carried.

It was moved and seconded that a forcing pit or propagating house be built, at a cost of about ($250) two hundred and fifty dollars. Carried.

On motion of Mr. VAN OSDEL, the Regent was authorized to buy good mounted microscope, not to exceed ($250) two hundred and fifty dollars. Carried.

The report of Committee on Drainage was then received:

REPORT OF COMMITTEE ON DRAINAGE.

Executive Committee of Illinois Industrial University:

Your special committee, to whom was referred the matter of underdraining, would respectfully report:

We recommend that the 40 acre plot that is to be devoted to horticultural purposes, be underdrained with tile, this fall. A portion of this land is wholly unfit for the purpose for which it is designed without underdraining; but with underdraining it at once becomes very valuable For both experimental and practical gardening we believe it indispensable.

The cost of the tile will be nearly $800. They can be procured of A. F. & G. Wilds, on the line of the I. C. R. R., at Anna, and will be warranted against breakage and the effects of the elements.

The work of surveying and superintendence could be done by persons already permanently employed in the institution. The further cost of labor would probably be about $1,200—total cost $2,000.

Respectfully submitted,
I. S. MAHAN,
THOS. QUICK,
JONATHAN PERIAM.

Ordered to be laid on the table for discussion at the evening session.

The bill of Elisha Eldred, for lumber and fencing, for $80, was allowed.

On motion, Judge Cunningham and J. Periam were associated as a committee to rent the Griggs' farm for the ensuing year. Carried.

Motion to adjourn to 7 o'clock, P. M. Carried.

JONATHAN PERIAM,
Secretary.

EVENING SESSION.

The Committee were called to order at 7:15 P. M.

It was moved and seconded, that the Board of Trustees be requested to meet on Wednesday, the 18th of November, 1868. Carried.

After discussion, it was moved and seconded, that the drainage of the garden plat and the experimental farm be prosecuted, at an expense not to exceed $1,200. Carried.

It was moved and seconded, that such alterations in the university building be authorized as will secure a dining room in the basement, and leave the present dining room free for a library and reading room. Carried.

Also, that the laboratory be fitted up with the necessary tables and fixtures. Carried.

It was moved that the library room be furnished with portable furnaces and pipes, for heating the recitation rooms and chapel. Carried.

The Regent's bill for unexpended balance of warrant 98, for the past year (1867), for $426 55, with vouchers, was examined, and the balance of $23 80, as due him, was allowed.

It was directed that the Professor of Chemistry keep an account of the chemicals used by each student, and the compensation for their use be left to the full Board.

J. M. Van Osdel's bill for $70, for attendance at four meetings, was allowed.

It was moved and seconded, that the Regent be authorized to procure six dozen additional chairs for recitation room and chapel. Carried.

The farmer was authorized to procure seed of five varieties of winter wheat, sufficient to seed ten acres of land, for experiment.

On motion, the meeting was adjourned, subject to the call of the Regent.

JONATHAN PERIAM,
Recording Secretary.

MINUTES OF MEETINGS OF EXECUTIVE COMMITTEE,

FROM JANUARY TO JUNE, 1869, INCLUSIVE.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *January 21st*, 1869.

Pursuant to call, the Executive Committee met, at the Regent's office, at 9 o'clock A. M.

Present—Messrs. Cobb, Cunningham, Goltra, Van Osdel, and the Regent.

On motion of Mr. EMERY COBB, the Regent's bill for balance of $4 28, for books for library, was allowed—the whole amount of said bill being $604 25.

Also, the following bills were allowed:

Samuel Richener's bill, for making desks, balance $28 75—whole amount of same being	$35 00
Hovey & Heffron	17 57
F. M. & A. Avey	11 78
G. E. Hessell	119 25
J. S. Henderson	14 00
James M. Thorburn & Co	40 49
Rural World	25 00
Iowa Homestead	2 00
American Naturalist	5 50
North-Western Farmer	1 00
Ohio Farmer	2 00
Horticulturist	1 75
Journal of Agriculture	1 50
American Entomologist	75
Rural World	2 00

On motion of Mr. VAN OSDEL, the amount of $16 50 was ordered to be taken from the library account.

inzie & Bowman	$65 00
. Gregory	47 19
l's Coal Mining Co	40 00
nas Franks	50 00
rge Stipe	35 00
ick Sullivan	40 00
ick Sullivan	20 00
brook & Parker	140 00
x Finder	70 00
charelon	87 00
. Busey	21 25
stern Rural	24 00
F. & G. Childs	150 00
ha Eldred	270 00
C. Beach & Co	8 70
llock & Crenshaw	384 87
S. Walker	18 00
erican Express Co	15 70
H. Blakesley	37 35
trick Lamb	37 00
trick Lamb	37 00
rge Stipe	35 00
S. Searfoss	83 33
n. K. Hosford (amount left blank at request of Regent)	
ll's Coal Company	20 00

On motion of J. O. CUNNINGHAM, 1500 copies of catalogues re ordered.

On motion of J. M. VAN OSDEL, there was appropriated from rary fund ——— dollars, for periodicals, foreign and Ameri-n.

On motion of Mr. GOLTRA, the Regent was authorized to pro-re a wood-cut of the farm, for insertion in the catalogue.

On motion of Mr. CUNNINGHAM, the Regent was authorized to w a warrant to pay lecturers.

On motion of Mr. VAN OSDEL, it was

olved, That the present course of lectures delivered by Dr. Warder be limited elve.

Bill of Journal Company, Springfield, was allowed, for $34.

The following preamble and resolution were offered by Mr. B, and carried:

ction 6, of the state laws, entitled "An act to provide for the organization and tenance of the Illinois Industrial University," says: "No money shall be drawn the treasury, except by order of the board of trustees, on warrant of the re-, drawn upon the treasurer, and countersigned by the recording secretary."

This section pre-supposes that the regent, treasurer and recording secretary will all reside where the institution is located. This not being the case, be it therefore,

Resolved, That all appropriations of money by this board be made for specific purposes and classified accordingly, stating amount appropriated for each; and that it shall be the duty of the recording secretary to furnish the regent and treasurer with a copy of such appropriation; and that all warrants drawn by the regent shall mention for what purpose drawn and the fund chargeable therewith.

On motion of Mr. GOLTRA, the following gentlemen—Messrs. Cunningham, Dunlap and Cobb—were appointed a committee to make arrangements for and receive the members of the legislature, with power to audit the necessary bills made.

On motion, one hundred additional loads of gravel were ordered to be bought.

The fees of Mr. Cushing, whose health did not permit him to remain at the University, were remitted.

On motion, the committee adjourned.

JONATHAN PERIAM, *Secretary.*

APRIL MEETING—1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *April 8th*, 1869.

The Executive Committee met at the Regent's office—and the meeting was called to order by the Regent, at 10:15, A. M.

Present—the Regent, Messrs. Cobb, Pickrell, Cunningham, Goltra and Wright.

Absent—Messrs. Brown of Pulaski, Griggs and Pullen.

On motion of Mr. Goltra, it was voted that Messrs. Johnson and Allen, who were engaged in an adjoining room with the business of the Agricultural committee, be invited to sit at their convenience with the Executive Board.

After considerable discussion of the limits of the jurisdiction of the Committee on Agriculture and Horticulture and the committee on Buildings and Grounds, the following resolution was adopted, on motion of Mr. Cobb:

WHEREAS, the territory and duties of several of the committees have never been precisely settled by the board; and whereas, it has become a matter of present practical importance that these duties and territories be more definitely settled; therefore,

1st. *Resolved*, That until the meeting of the board the Horticultural Committee shall have charge of the 40 acre tract, the orchard on the western part of the experimental farm and ornamental grounds.

2d. *Resolved*, That the Agricultural Committee shall have charge of the stock farm and the experimental farm, except so much of the latter as shall be occupied by the orchards, to which is hereby assigned the 53 acres lying west of the line Wright street.

On motion of Mr. COBB, it was voted that the bills of "Prairie Farmer" and "Western Rural," and such other papers as may have bills against the Illinois Industrial University, for advertising winter lectures, be referred to the Corresponding Secretary, to report to this Committee, as soon as practicable, as to their correctness.

The bill of Dodson and Hodges, $32 48, was then audited and allowed.

On motion of Judge CUNNINGHAM, the Committee adjourned to 1:30 P. M.

—

AFTERNOON—1:45 P. M.

The Committee met, pursuant to adjournment, and the following bills were audited and allowed:

Prairie Farmer, March 19th, 1869, advertising seed corn	$19 20
A. F. Childs, March 27th, draining tile	126 00
Hulburd, Herrick & Co., March 30th, hardware	28 40
Elijah Eldred, March 29th, lumber	90 79
" " 31st, "	201 45
" " " "	90 31
E. Snyder, April 8th, postage and petty expenses	30 87
Wall's Colliery Coal Mining Company, March 30th	20 00
S. D. Childs, jr. & Co., seal and press, March 30th	20 00
Chas. W. Rolfe, March 30th, pump	12 55
Hovey & Heffron, March 26th, kitchen garden and flower seeds	24 07
Seed for market garden	34 80
Garden syringe, etc	18 50
Fuller, Finch & Fuller, March 29th, oil and lead	83 90
Miller & Toll, muslin	2 00
Trevett & Green, hardware	9 05
Trevett & Green, twine	40
J. M. Campbell, seed oats	37 87
W. F. Bliss, two sugar hogsheads	2 00

On motion of Judge CUNNINGHAM, it was ordered that Dr. Warder's bill for $150, for three lectures delivered in January, 1869, be referred to the Corresponding Secretary, with instruction to report, for the information of the Executive Committee, the particulars of the arrangement made with Dr. Warder.

A recommendation from the Faculty "that the rooms south of the library should, at as early a day as possible, be prepared for the reception of the geological and mineralogical cabinets," was, on motion of Judge CUNNINGHAM, adopted; and it was ordered that it be carried out immediately.

The Regent presented the following proposition, from Prof. Burrill, for the sale of a cabinet of minerals now on exhibition in the library room of the University:

INDUSTRIAL UNIVERSITY, *April 8th*, 1869.

GENTLEMEN: The cabinet of fossils and minerals, now in cases in the University, and belonging to Mr. M. S. Hall, has been left in my hands for sale. Mr. Hall's price is $1000; but, owing to pressing demands for money, he is desirous of disposing of it, even though a much less sum be obtained.

The following statement, based upon my own count and estimate—the latter drawn from every source of information at hand—may aid in determining the value of the collection:

750 fossil plants, of about 35 distinct species, being about one-fourth of those known to exist in Illinois—40 cents, each	$300 00
25 extra fine geodes, at $3	75 00
70 medium " 1	70 00
70 smaller " 30 cents	21 00
40 specimens of minerals, granites, etc., 40 cents	16 00
60 fine specimens of pol. marble, agate crystal spars, at $3	180 00
200 animal fossils, at 30 cents	60 00
Total	$722 00

Duplicate specimens, if valuable separately, are equally so for exchange; but as there are many of these, and exchanges will be attended with some expense, and also making due allowance for the sale of a whole collection rather than by single specimens, I offer it to you for the sum of six hundred dollars.

T. J. BURRILL.

On motion of Judge CUNNINGHAM, it was voted that the proposition be referred to Prof. Stuart for an opinion in regard to the propriety of making the purchase, with instructions to report to the next meeting of the committee.

On motion of Judge CUNNINGHAM, it was voted that the proposed change of the walk running parallel with the main drive on the west side of the grounds be entrusted to Mr. Franks.

On motion of Mr. COBB, it was voted that the appropriation made for buildings and grounds, allowing $2,575, be disbursed by the Regent, with the advice and consent of the chairman of the Committee on Buildings and Grounds.

On motion of Judge CUNNINGHAM, it was ordered that regular monthly meetings of this committee be held on the first Wednesday of each month, for the transaction of business.

On motion of Judge CUNNINGHAM, it was ordered that the carpenter be instructed to complete, as soon as possible, the sidewalk on the street in front of the University building as heretofore ordered.

On motion of Judge CUNNINGHAM, the following preamble and resolution were adopted:

WHEREAS, the Regent has offered to visit some of the chief Industrial schools of Europe, during the summer vacation, at his own expense, to observe carefully their methods and facilities of instruction, to aid in the further development of the University; and whereas, such observations, at the present stage in the progress of the University, seem important and may prove of great benefit; therefore,

Resolved, That leave of absence be granted to the Regent from the middle of May to the opening of the autumn term; and he be requested to make thorough examination and copious notes of such things, in the several agricultural and polytechnic schools he may visit, as may serve to aid us in the more perfect organization of this Industrial University.

On motion of Judge CUNNINGHAM, it was voted that the authorities of the town of Urbana be requested to vacate the public road on the east and south side of the northwest quarter of the northwest quarter of section 19, township 19, range 9, and to locate a road on the north side of said tract, to connect the road, as now laid on the north side of said section 19, with the road laid on the range line between ranges 8 and 9.

The Agricultural Committee brought in their report; which was recommitted, with instructions to report to the Executive Board.

An application of Prof. Wm. M. Baker, for permission to have his lumber purchased and shipped with the lumber of the University, was not granted.

On motion of Mr. PICKRELL, it was

Resolved, That the state appropriation made for the Agricultural department be appropriated for the purposes named in the act; that the state appropriation made for the Horticultural department be appropriated for the purposes named in the act; that the state appropriation for the Chemical department be appropriated for the

purposes named in the act; and that the state appropriation made to be used for other apparatus and books be appropriated for purposes named in the act.

On motion, the Committee adjourned, to meet Wednesday, May 5th, 9 A. M.

J. M. GREGORY, *Regent.*

W. F. BLISS, *Secretary.*

MAY MEETING, 1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *May 5th*, 1869.

The Executive Committee met, pursuant to order, at the Regent's office, at 9½ o'clock A. M.

Present—Messrs. Cunningham, Goltra, Pickrell, Pullen and the Regent.

Absent—Messrs. Cobb, A. M. Brown, Wright and Griggs.

The Regent read the following statement of the book-keeper, of accounts, from March 12th to present date:

EXPENDITURES.

Board expense	$520 25
Salaries	3,046 94
Farm account	603 82
Building account	29 15
University grounds	291 49
Chemical laboratory	61 05
Library account	21 50
Student's labor	117 60
Fuel and lights	60 00
Material and lumber in hands of carpenter	568 35
Purchase of 2 lots	425 00
Salaries of treasurer and corresponding secretary	700 00
Stationery, etc	20 90
University seal	20 00
Visit of legislature	66 00
University buttons	25 00
Incidental expenses	272 42
Total expenses	$6,927 80

There have been collected by me, and remitted to the treasurer, the following amounts:

March, 1869, various fees	$612 00
Farm produce	125 45

April, 1869, fees	$772 50
Collected for coal	39 48
Total	$849 48

Respectfully,

E. SNYDER, *Book-keeper.*

The following accounts were then examined and allowed:

May 3d, C. G. Larned, hardware, etc., for laboratory	$80 15
April 10th, Johnson, Myers & Co., repairing agricultural implements	6 45
April 17th, F. K. Phœnix, flowers and seeds	22 60
April 10th, Adams, Blackmer & Lyon, pamphlet cases	21 60
April 26th, D. W. Weir, trees	58 60
April 23d, R. B. Nelson, whitewashing and plastering	25 15
April 16th, Moulding & Harland, flower pots	15 75
April 23d, Union Coal Co, 1 car coal	15 00
April 23d, Fuller, Finch & Fuller, 2 boxes glass	8 88
May 3d, Chas. G. Larned, hardware	3 25
April 13th, C. W. Beyer, insurance on library	21 50
May 4th, Prof. Stuart, expenses for chemicals	4 57
May 3d, F. M. Avey, blacksmithing	12 50
May 4th, Hibbard & Finch, seeds and plow	33 0
May 4th, Trevett & Green, Hardware	15 70
May 4th, E. T. Whitcomb, recording deeds	3 75
May 4th, G. Hessell, harness repairs	7 95
May 4th, G. K. Hosford, oil, chimneys, etc	7 72

The Committee on Buildings and Grounds offered the following:

The Committee on Buildings and Grounds, on examination, finding that the cast iron water-table proposed, by the Committee, will be of inferior value and efficiency to a water-table made of tin or galvanized iron, with a timber so placed as to make a proper projection, do hereby recommend such change in the plan, and ask the Executive Committee to authorize the same.

Respectfully, submitted,

M. C. GOLTRA, *Chairman,*
J. O. CUNNINGHAM,
J. M. GREGORY.

On motion of Mr. PULLEN, the recommendation was accepted and the change authorized.

On motion of Judge CUNNINGHAM, it was voted that the Regent be authorized to make such purchases of books and apparatus, in Europe, as he may find can be made with advantage there; and that, for this purpose, the necessary warrants be drawn on the appropriation made for library and apparatus.

On motion of Mr. PICKRELL, it was voted that a warrant of $1,000 be drawn for the Committee on Locating Lands, and

accounted for by said committee, as fees and expense in locating said land scrip.

On motion of Judge CUNNINGHAM, it was

Resolved, That the faculty be authorized to publish such catalogue and circular as, in their judgment, may be deemed necessary.

Adjourned to meet at the call of the Regent.

—

AFTERNOON.

The Committee was called to order in Dr. Gregory's library, at 12:30 P. M.

On motion, it was voted that Prof. Stuart be authorized to have the room intended for a laboratory enlarged.

Permission was given to the Professor of Agriculture to have put up in his room a case for agricultural specimens, books and documents.

The following communication was received from Prof. Stuart:

The undersigned, to whom was referred the valuation of the cabinet offered for sale by Prof. Burrill, respectfully begs leave to report that, in his judgment, the said cabinet is worth $500.

A. P. S. STUART.

URBANA, *May 5th*, 1869.

On motion of Mr. PULLEN, the report of Prof. Stuart was accepted, and the Regent was authorized to purchase the cabine for $500, subject to the State appropriation.

On motion of Mr. GOLTRA, it was voted that the Regent be requested to purchase a pump for the well of the University.

On motion of Judge CUNNINGHAM, it was voted that the salary of the Regent to the first of September, 1869, be paid in advance.

On motion of Judge CUNNINGHAM, it was voted that the gardener's house be located at such point on Green street as the Regent and the Professor of Agriculture may determine.

On motion of Mr. PULLEN, it was voted that the experimental orchard be planted in quincunx order, with trees 24 feet apart, and that the East and West avenue be extended to the western line of the orchard.

On motion of Mr. PICKRELL, the Recording Secretary was authorized to purchase a desk for his office and procure a copying press.

On motion of Judge Cunningham, it was

Resolved, That the Regent be authorized to purchase such amount of hard coal as, in his judgment, may be required for the use of the University during the winter months.

On motion of Mr. GOLTRA, it was ordered that in planting hedges on the outside of the experimental farm, they be set two rods from the lines on each side of the same, except on the west side, along Wright street, where the hedge shall be set 14 feet from the line, and along Mount Hope avenue, where it shal. be set 40 feet from the line.

Proposals for a new roof on the University building were then opened, in presence of the committee, and, on motion of Mr. PICKRELL, referred to the Regent and Judge Cunningham, with power to act.

J. M. GREGORY, *Regent.*

W. F. BLISS, *Secretary.*

JUNE MEETING.

UNIVERSITY BUILDING,
URBANA, *June* 2, 1869.

The Executive Committee was called to order in the Regent's office, at 10 o'clock, A. M., and, in the absence of the Regent, Mr. Goltra elected chairman.

On calling the roll, it was found that only Messrs Cobb, Pickrell, Cunningham and Goltra were present; and, on motion of Mr. Pickrell, the Committee, for want of a quorum, adjourned to Wednesday, July 7, the time of their next regular meeting, without transacting any business.

M. C. GOLTRA, *Chairman*

W. F. BLISS, *Secretary.*

AGRICULTURAL LECTURES AND DISCUSSIONS.

Following the precedent of the Yale agricultural lectures of 1860, the following course of agricultural lectures and discussions were held at the Industrial University, in January of 1869.

A number of gentlemen from Illinois, Missouri and Michigan, all eminent in their respective specialties, kindly consented to aid gratuitously in the inception of the first of what it is to be hoped will be a long series of farmer gatherings for mental instruction in the art and science of agriculture.

Prof. BLISS and SANFORD HOWARD were unable to fill their appointments. With these exceptions (resulting from circumstances beyond the control of the gentlemen mentioned) the lecturers were all able to be present, and performed the parts assigned them.

A large portion of these lectures have been solicited for and published in the Missouri Agricultural Report, for 1868, with the following note by the Secretary, Dr. L. D. Morse:

"Thus was inaugurated a new and probably important movement in Western agricultural education and improvement. Regarding it as an experiment, it may safely be recorded as resulting successfully. The lectures and discussions were attended by the students of the University, seventy or more in number, quite largely attended by the citizens of Champaign and vicinity, and there was a goodly number from various parts of the State. The lectures were, most of them, of an eminently practical character, and the discussions lively and interesting."

[CIRCULAR.]

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, *December* 19, 1868.

The first annual course of agricultural lectures and discussions, instituted by the Illinois Industrial University, in Champaign, commencing Tuesday,

January 12th, 1869, and continuing during four days of that and the subsequent week, with three sessions in each day.

This is intended to be an annual gathering of the farmers of the State, and of their sons and daughters, for the purpose of discussing the best methods of agriculture; and it is earnestly hoped that all who desire to improve our tillage, our crops and our live stock, will be present and lend a helping hand.

No charge is made for admission. The University provides a hall properly warmed and lighted, and pays the expenses of the gentlemen who have kindly consented to open the discussions.

Each lecture, essay or "talk," will be followed by a discussion on the same subject, in which all are invited to participate.

Dr. John A. Warder, author of "American Pomology," will lecture daily from 4 to 5 P. M., on the subject of Fruit Culture.

Good boarding places can be had convenient, and at reasonable rates.

Railroads will be solicited to return persons in attendance at reduced rates.

J. M. GREGORY, *Regent.*

W. C. FLAGG, *Corresponding Secretary*

PROGRAMME.

TUESDAY, January 12th.

Morning, 9 o'clock. Introductory Address, Agricultural Facts and Theories.—Dr. J. M. Gregory.
Afternoon, 2 o'clock. The Natural Sciences and Agriculture.—Prof. W. F. Bliss.
Evening, 7 o'clock. Relation of Chemistry to Agriculture.—Prof. A. P. S. Stuart.

WEDNESDAY, January 13th.

Morning, 9 o'clock. Meteorology.—Prof. W. M. Baker.
Afternoon, 2 o'clock. The Soils of Illinois.—H. C. Freeman, of the State Geological Survey.
Evening, 7 o'clock. Management of Soils.—Dr. John A. Warder.

THURSDAY, January 14th.

Morning, 9 o'clock. Grass.—Dr. L. D. Morse, Editor Journal of Agriculture.
Afternoon, 2 o'clock. Corn.—M. L. Dunlap, Agricultural Correspondent Chicago Tribune.
Evening, 7 o'clock. Wheat.—W. C. Flagg.

FRIDAY, January 15th.

Morning, 9 o'clock. Potatoes.—Jonathan Periam, Superintendent Practical Agriculture.
Afternoon, 2 o'clock. Root Crops.—Jonathan Periam.
Evening, 7 o'clock.—Agricultural Book-keeping.—Capt. Ed. Snyder, Instructor in Book-keeping.

TUESDAY, January 19th.

Morning, 9 o'clock. Orchard Fruits.—Dr. E. S. Hull, of Alton.
Afternoon, 2 o'clock. Grapes.—Hon. Geo. Husmann, of Hermann, Mo.
Evening, 7 o'clock. Small Fruits.—Samuel Edwards, of Lamoille.

WEDNESDAY, January 20th.

Morning, 9 o'clock. Breeds of Cattle.—Sanford Howard, Secretary Michigan State Board of Agriculture.
Afternoon 2 o'clock. Horses.—Col. N. J. Colman, Editor Rural World.
Evening, 7 o'clock. Swine.—Hon. Elmer Baldwin.

THURSDAY, January 21st.

Morning, 9 o'clock. Sheep.—A. M. Garland, President Illinois Sheep Growers' Association.
Afternoon, 2 o'clock. Agricultural Botany.—Assistant Professor Thos. J. Burrill.
Evening, 7 o'clock. Vegetable Physiology and Economy.—John H. Tice, Secretary Missouri Board of Agriculture.

FRIDAY, January 22d.

Morning, 9 o'clock. Rural Economy and Rural Life.—Dr. J. M. Gregory.
Afternoon, 2 o'clock. Fences and Hedges.—Dr. John A. Warder.
Evening, 7 o'clock. Timber Growing.—O. B. Galusha.

FIRST DAY.

ADDRESS OF WELCOME: BY DR. J. M. GREGORY.

GENTLEMEN AND LADIES: It is my high privilege to-day to welcome you to the Industrial University to its first annual course of lectures. We inaugurate to-day a part of the plan of operations, contemplated from the outset, to extend the benefit of this university beyond the ordinary students who shall gather here, out into the fields of adult life and of actual labor. The university, in this movement, leaving for the moment its place near the gateways of practical life, where it sits to train those about to enter, and to fit them for life's great duties, seeks to go out into the very midst of the busy throng of labor, and mingle its counsels and lend its light to the struggling, toil and thought of the practical world. Not content to teach its science to the young, it also seeks to enlighten, with its learning, the labors and the lives of the grown men and women who are doing the world's great work and bearing the burden of its endless battles. Teaching to beginners the elements of science, it also desires to take part in the solution of the fresh problems which are always arising in the progress of practical affairs. If science has gathered any clear light from the study of the past, when can it be better displayed than in aiding to solve the questions which perplex the present, and in thus opening the clogged highways which lead to the future? Through these annual courses of lectures addressed to the actual cultivators of the soil, the university will mingle its voices with yours in the very midst of the farmers and fruit-growers of the State.

But thus while welcoming you to these lectures as learners, we do not forget that you come also as teachers, and we extend to you a double welcome as bringing to us, fresh from the great fields of practical life, the latest questions which have arisen there, and the latest and best experience which have been gained. Your assembling here will help us to give a still more practical character to our institutions, and your discussions will lend a new and real air and value to the sciences our pupils are studying. We have to thank you, therefore, as well as welcome you, for the aid thus lent by your presence here in giving to the university the "pre-eminently practical character" the Trustees desire it shall bear. It will be our study and pleasure to make your stay here as pleasant and profitable as possible, and we solicit your co-operation to give to this initial lecture session such interest and value that the Trustees may feel encouraged to repeat it in the successive years.

It has already been seriously proposed to hold other lecture sessions in different parts of the State; and, if sufficient encouragement is given that

the farmers and other citizens will attend, two such sessions, of three or four days each, will probably be held during this year—one in the northern and one in the southern part of the State. It is by this free and frequent interchange of views with the practical agriculturists of the State that the university hopes to work out one part of its great mission—the diffusion of agricultural science among mankind. Establishing some community of ideas between itself and the great classes in whose interest it works, it will be better able to organize its wide-reaching places of scientific observation and experiment, and will bring under its eyes the immense fields of research which it has undertaken to explore.

And, finally, we welcome you here that you may see for yourselves the work we are doing and are preparing to do for the cause of agriculture and the industrial education. We are confident you will say our plans are not one whit too broad to teach thoroughly those great and splendid branches of learning which relate to "agriculture and the mechanic arts;" and you will agree with us that no learning is too high to fit men to solve the great mysteries of seed and soil, and to master the mighty agencies of growth through which the brown earth is changed to golden grain, and pulpy fruit and fragrant flowers.

Again and heartily welcoming you, in the name of the university and of its faculty, I proceed to discuss the topic which has seemed to me a fitting one to open this course of lectures.

AGRICULTURAL FACTS AND THEORIES.

I regret that, for want of time, I shall be compelled to make this discussion in an extemporary form.

And in the first place, looking at the crude and disjointed facts which agricultural writers give us, we come to the conclusion that we have no *science of agriculture*. Botany is a science, because the facts which underlie it are established by fixed laws. Chemistry is a science for the same reason. But agriculture is not a science in any sense. It is simply a mass of *Empiricism*. If any one doubts this, let him attend the agricultural clubs and horticultural conventions, and he will be convinced. The ever recurring questions are still unsettled. One man has this experience, and another that, which is just the opposite.

One finds it most beneficial to plow his manure *under*. Another *top-dresses*. One plows in the *fall*, another in the spring. One *shortens back*, another leaves his trees to grow at pleasure.

But let it not be supposed that, in this statement of the present condition of agriculture, I, by any means, slander or underrate the value of the work already done. When I notice the change that has been wrought during this nineteenth century, and how far it is in advance of previous centuries in agricultural knowledge and practice in Northern Europe and England, and other parts of the world, we cannot too highly estimate the advancement made.

But after all, this advancement has been made in the way of *experience*. And we have nothing but experience. Hence we say, agricultural science is

empiricism, and not an established science. It may be best to define what we mean by *science*.

Knowledge is not necessarily science. A great mass of knowledge is not necessarily scientific.

A great many facts, gathered and classified so that they may be made available for use, do not make science.

Just as in medicine, a large amount of facts are known in regard to specific medicinal substances, yet this does not constitute science.

Science can only be founded when the actual scientific fact belonging to that department which this scientific truth proposes to investigate, shall have been referred to fundamental laws, by which this fact may be explained and out of whose operations they grow.

For ages there were no certain facts known about plants—respecting their forms, shapes, or their qualities. What were supposed to be facts had not been traced to elementary truths which conform to laws. There is no science about it.

For ages there was much known about chemistry, but there was no science of chemistry.

Beautiful *theories* were based upon the facts gathered, but no science. I repeat, therefore, a mere knowledge of facts, however extended, does not constitute science.

True science is built upon asserted facts which have been reduced to scientific shape. Everything accidental thrown off—facts referring to the established laws of nature—growing from them and explaining them.

Agriculture has not yet reached these facts.

Ten million busy hands are occupied in looking up these facts, which must be referred to invariable laws, that we may be able to direct the result.

Goldwin Smith gives this definition of science: "It enables us, from a knowledge of invariable laws, to predict from certain facts what other facts will follow." Now agriculture has not yet reached that state of advancement.

The question whether agriculture can rise to the claim of being a science is an important one. We think it can; but let us look at the means by which this must be done, if at all. Now there are two stages of growth in this direction.

The first stage is that of simple facts—the stage of close observation and close deductions from these observations.

Every science has passed through this stage. If we go back in history, we will find that all sciences once occupied just that position which is held by agriculture to-day.

Take Chemistry. There was a time when it was held that this world was made up of four elements—earth, air, fire and water; and upon these supposed facts theories were built up.

So Chemistry, as well as other sciences, has had its stage of close observation and close speculation upon these facts.

The second stage comes when all theories fail—when the foundations upon which we have built are swept away by larger experience—when we throw away all theories and come back to a careful and calm statement of facts—fearful to take any conclusions beyond the demonstrated fact, still patiently following up these facts with persevering inductive processes.

To explain further the nature of these operations, I ask your attention to the classification of the methods in which the mind operates in building up a science. All science is the growth of human intellect. Science does not lie written upon nature, but is the result of the operation of the human mind working upon these facts.

Now, how does the mind work? There are two processes.

One is called *Induction*—that process by which we are led into truth step by step, and no further.

The other process is called *Deduction*—that process by which we begin with assumed facts, or facts proven, and spread out from that and form growth.

Now these two processes lie the one over against the other. I am very solicitous to be understood upon this point, for it seems to me important that we come to understand these two processes.

The first method is by careful induction, like a man walking upon stones and feeling his way one step at a time, and going only so far as he can see where to place his foot and no farther, and thus ultimately reaching the law.

But there is another process which takes the law when established, or that takes some fact believed to be true, and makes to grow a whole upper growth of theories, or system of theories. Now neither of these is to be eulogized at the expense of the other; yet the period of induction is the period of progress—the period that throws away all theories and comes to measure fact with fact—lays one brick upon the other let the result be what it may; let the plan of the architects appear when the work is done. Now, taking these two stages of science, we determine the question: "Can there be any science of agriculture?"

Agriculture is both an art and a science. So far as it simply applies to practice in special rules directing to particular results, it is an art. I imagine that most men class it as an art.

But authority or usage permits us to class as sciences some branches of knowledge which are combinations of the facts of several sciences. Take, for instance, Geography. It takes from Botany the distribution of plants; it uses Geology, Meteorology, Zoology and other sciences to explain facts which belong appropriately to each, and not to Geography alone; yet we call Geography a science, because these several sciences combine together in the explanation of one single object—the world. While Geography has not single fact of its own, it gathers all these facts around one central object, and usage permits us to speak of Geography as a science. In this sense, agriculture, the great mother of arts—the all-sustaining, fundamental art—the art of

all arts—may claim to be a science. It combines many sciences on one common field—the field of animal and plant life.

Now let us see how science must grow. There is a distinction in facts which, it seems to me, the sooner we recognize and understand, the sooner will we advance to real science. There are common facts and scientific facts. A common fact is not necessarily a scientific fact.

What is a common fact? It is a fact which presents itself in our common observation or lies in our common observation of things. It is a common fact that many bodies, unsupported, fall to the ground. The real and essential character of the common fact may not be all comprehended. Thus the fact just mentioned was once so misunderstood and explained as would now seem absurd to us. For example, a philosopher of the middle ages undertook to explain the reason why a half dozen blocks would press harder downward than one block.

The blocks not occupying any wider space on the surface, being placed one upon the other, he could not see how it was that they pressed harder than one block. He did not suspect that any force was at work while the blocks lay at rest. His explanation of the fact was, that there was in the supporting body a certain sort of feeling or anticipation of the coming block, which aroused its resistance, and hence weight resulted.

But when statics became a science—when men came to understand that bodies press directly as the amount of matter, and inversely as the square of the distance—then the common fact became a scientific fact precisely stated. Many of the statements of Aristotle are to-day a laughing-stock for school boys. They simply take common facts and undertake to base upon them scientific deductions.

What is a scientific fact? It is simply a fact with all the husks stripped off —a fact from which has been eliminated the accidental, variable and non-essential, and there remains the essential and invariable.

The fact that all bodies have weight in proportion to the amount of matter and in the inverse ratio of the square of their distance from the earth, is a scientific fact; and upon this fact we safely base our deductions in physical science. In agriculture, facts seem to be settled; and we often proceed with our deductions based upon common facts, which are always fallible, having in them the same uncertainty and indefiniteness which belonged to the fact.

The trouble with agriculture is, as it has been with all the early sciences, that deductions begin too soon. It does not require much labor or ability to make loose deductions. Any mind with a little knowledge and some imagination can do this. None but well trained and thoroughly honest and clear minds will patiently confine themselves to induction.

Even Bacon, the founder of inductive philosophy—of which he has at least the credit—even Bacon, while he insisted on the necessity of not going beyond the facts of science, afterward presented one of the very worst instances of bad deductive reasoning. He did not follow out his own prescription at all. Aristotle proclaimed truth as clearly as Bacon did. But they both ad-

vanced too rapidly in their deductions, and propounded some of those absurd theories of which they stand convicted. Hence we say that it requires a patient and honest mind to be a good inductive philosopher.

It is said that Newton noticed the fall of an apple—but he did not draw all his deductions from the fall of the apple; he proceeded from this as a first step. The apple falls to the ground—then he proceeded to notice that other things fall, and that *all things* fall, that even the *smoke* falls whenever it enters a light medium.

Then he proceeded to inquire whether the planets are not falling, and whether it is not a scientific fact that all things fall or weigh directly in proportion to the matter they contain, and inversely as the square of the distance.

It was questioned whether the moon was not so far away that it will not fall. With the supposed facts respecting the weight and distance of the moon and planets he carefully proceeded to the solution of the problem. But it did not prove.

Now, a deductive philosopher, having the common fact, would have jumped at the conclusion and constructed the universe before Newton had his first scientific fact fairly proved.

But Newton did not take a single thing for granted. When he found that it did not prove—that the earth was not heavy enough to hold the world in its orbit—he laid aside his problem.

Others would have said, "It is true it does not quite work, but it is near enough;" and they would have held on to the conclusions half proven.

Afterward, when it was found that the geometers gave to the earth much larger dimensions, by seven hundred miles, than it was before supposed to have, Newton takes the new facts and proceeds carefully and surely to demonstrate his theory, which to this day is the received doctrine of science.

None but the best educated, none but the most honest minds will pursue the inductive process.

The great temptation is when men get two or three facts, they begin at once to build upon them.

I repeat: in deduction, theories which are built on common facts cannot be certainly well founded, and may not be worth the paper on which they are written. We can only build safely on scientific facts.

We have here, then, the *kind of facts* by which agricultural science may be built up—scientific facts. As yet, we have little else than theories built upon available experience. We are in the position of those who began, in the age of Newton, the study of astronomy, or of those who, in the age of Linnæus, began the study of botany; when the laws of the operation of the force pertaining to these sciences were imperfectly understood.

We to-day start with great vantage ground. We have facts and experiences which must lead to science. Agriculture is yet *Empiricism*, but it is doing the thing that will lead to success. We have learned, for example, that fertilizers do influence crops. We need not go back very far to find the time when the manure was utterly destroyed and cast out, as not only worth-

less, but it was even believed to be destructive to crops. But upon this point we have made advancement, and we have proved that these fertilizers do promote the growth of crops.

We need go back but a little while when deep plowing and thorough stirring of the soil were deemed necessary to promote growth. Hence, I repeat that with correct views upon these and other points, we start with great vantage ground over those who have preceded us.

What yet remains to be explored?

I think we need to determine the exact operation of the laws or facts controlling agriculture. We know that fertilizers, for example, promote plant growth. This is an established fact; but how they promote the growth of plants is not definitely settled. It is not determined whether fertilizers feed the plant directly, or help the plant to draw from the atmosphere the food it needs.

Now, what we want is to get this valuable process determined—to ascertain, if possible, how far it acts, if at all, conjointly with the sunlight and other agents in the soil, so that we may know just *how much* and *what* it does, and *how* it does it.

We need to attend, also, to the effect of the natural agents of Light, Heat and Moisture. We know that a potato grown out of the light will not have color. We know, also, that a plant without warmth and moisture will not germinate, and that a withdrawal of these will check the growth of plants; but the precise influence of these agents we do not know.

We need to make a more careful classification of the hostile forces which oppose the horticulturist and the agriculturist. And this leads me to say, finally, that the greater and more difficult work remains to be done. We need to understand the character and habits of our insect enemies, that we may protect ourselves against their ravages. There are unfavorable conditions in regard to heat and cold which neeed to be understood that we may fortify ourselves against danger. So in the animal world, we need to understand the precise character of the diseases that attack our animals—and these need to be so carefully ascertained that they become *scientific facts*.

I trust that the day is not distant when we shall have something more than *experimental* science—a science settled down upon the laws of nature, and which shall predict the result and reach conclusions with the certainty of mathematical test.

It is not to be supposed that any art can reach that degree of attainment of the *hand* that guides it. The *art* will always lag in the rear. Science must go before. It says, "thus far shalt thou come and no farther. This is the way—walk ye in it."

So, agricultural science must go before and mark the place where lies possible culture.

FRUIT CULTURE.

INTRODUCTORY LECTURE BY DR. JOHN A. WARDER, OF CINCINNATI.

In standing before you here to-day, I feel that we are stepping upon the threshhold of a new era, toward which some of us have been looking most anxiously for nearly a quarter of a century. Several of the noble citizens who first bestirred themselves upon the great subject of *Industrial Education* are still among us. The influence of their generous efforts has been felt by thousands, of whom many are here present to witness the results of their efforts in our Industrial University.

To them, to these, and to the great public, whom we hope to see deeply interested in the great problem of practical education, a few words may be addressed by one who has long been deeply interested in the subject; who, as a father, has again and again revolved the important question, How shall we best educate our sons and our daughters for the great business of life which lies before them? He hopes that his utterances will be received in the kind spirit which actuates him in presenting them.

Practical Education seems to be a very simple expression, and yet how few of us will agree as to what it shall mean! One may say that it is that education which comes through the fingers, rather than by the means of any of the other senses. It is that which we may learn by absolute practice while we are engaged in our daily work—that surely is practical enough. But it is not enough to satisfy some of us who desire to cultivate all the senses as well as that of touch, and the control of our voluntary muscles.

Others may claim for practical education, that it shall consist only in the instruction of the pupils in that kind of knowledge which will be of every day use, and they would eschew or condemn everything beyond this—alas! what limited ideas of this great desideratum that has exercised the thoughts of some of our greatest minds!

Some would teach mathematics only, as applicable to the various arts, while others will claim the supremacy of languages as the best method of developing the mental powers which are to be the means of improving all the arts.

We have writers who understand the subject, who have given it their serious and studious attention, who know that whereof they affirm, when they give us, as their ultimatum, that it is necessary to educate the whole man in all his faculties to produce the perfect result.

To this proposition we must all agree; still, we demand *practical education;* and properly so, for it is clear that very few of us can ever by any possibility have the time, the patience, or the opportunity to become *perfectly educated.*

If asked to give a solution of this great problem, and to indicate how the important advances of science may be brought to aid the various arts of life and reduced to the comprehension of those who intend to apply themselves to these several pursuits, in the great business of the world, I should with diffidence suggest that the greatest possible amount of good might be done, by inviting sensible and practical men, who are well posted in their special

callings, and having them teach the classes—at the same time throw open the doors widely to all applicants for instruction, of whatever age or sex, and give them free choice in the selection of the studies they would pursue Make the institution a university in fact, with its schools of chemistry, of physics, of mathematics, of botany, of geology, of zoology, and especially of mechanics and of agriculture.

The author of the act of Congress, by which this noble grant has been provided, seems to have similar views. Though a son of the pine tree State, on our farthest eastern boundary, Mr. Morrill appears to have caught the true spirit of our prairie call for *Industrial Education*, and to have fully appreciated the very general desire manifested in other parts of the country for the establishment of institutions for practical instruction, which, it was fondly hoped, would supply the want that could not be satisfied by the classical colleges of the country as they were generally conducted.

Mr. Morrill assured me that if the States which accepted the grant made a misapplication of the endowment, they would be held responsible for the result. In his bill it is decreed that the tuition fund derived from the sale of the land shall forever be appropriated to the support of schools for instruction in *agriculture and the mechanic arts*, from which (it was added as a legislative fence-rider), that the languages should not be excluded, and that military tactics should be taught.

One after another, all of the sciences, chemistry, physics, and especially mathematics, will each claim a prominent place in a course of study that may be devised to carry out the spirit of the enactment of Congress; but, the truth must be admitted—we none of us know what we really want, what we need, what we can do, nor what we cannot do. A great experiment is before us awaiting its solution—we are setting out to build up from nothing, these great *schools of science*, schools *of applied science*, as Professor Gilman calls them—there are no well considered, nor well digested plans—there are no well prepared, well drilled classes to receive our instruction—and worse than all, there are few or no well qualified teachers for these schools of applied science. The very absence of such school has made us two great orders of men: those who know only in the way of theory, and those who know only in practice. From either of these two orders we are forced to draw our teachers, and eventually, we hope to find the right men for the right places. It may be only after repeated siftings; therefore, my friends, your kind patience is craved on behalf of the devoted men who have nobly acted as trustees for this institution, next on behalf of us, their agents, who have the honor of being their appointees in the important position of teachers of the classes, whom your Legislature, in its wisdom, has directed to our walls.

Be gentle in your criticisms, and be just in your decisions; remember that our cause is an experiment, and that if it should not fully meet the wants of the people, your excellent board of trustees have it in their power to introduce such modifications as may appear to be necessary.

And now I beg your patience for a few moments, on my own behalf. When I accepted the honorable appointment of lecturer in this institution, it was

with diffidence in my own ability to fill the station as we all wish to see it filled.

To some of you, who favor me with your presence, it will seem as though nothing new was advanced in these lectures. Certainly nothing but well established truths will be taught. To some of you, my seniors in horticulture, these things are already familiar—but it is safest for a teacher to adopt the theory of the absolute ignorance of his class. This will induce and require him to descend to the most trifling minutiæ, which may weary the adept, but they are all important to the novice. The course proposed for these lectures is planned upon this proposition.

Upon the present occasion I propose to occupy your attention with a few general remarks upon the following questions:

Why do not all of our farmers have plenty of fruit?

Why should all who live in the country grow fruit crops, just as they now produce grain, grass, and live stock?

The first question may be answered very readily, for most of those who have no fruits; it is simply because they do not try to have them, and this is the very natural result of their ignorance of the means of obtaining an abundance of these blessings upon almost every farm in the United States.

The latter question may be answered by enumerating some of the great advantages of fruit growing. These are primarily the *health* of the families of the producers, where fruits are freely consumed upon the table at all seasons of the year; next, the *pleasure* attendant upon their propagation, their culture, and above all, the satisfaction derived from the harvesting and consumption of these products.

It is a well established axiom in the medical profession, that the regular consumption of fresh, well ripened fruit, is conducive to health, and it is also a fact, that the* farmers of our country are not so *well fed* as they should be. This is nobody's fault but their own. True, they cannot have so great a variety of meats as those who reside in towns and villages, but they may enjoy the greatest profusion of fresh vegetables, and a succession of ripe fruits the year round, if they will but choose to take the trouble to plant and cultivate even a small portion of their land as a garden and orchard.

An appeal on behalf of fruit culture may also be made to the more sordid motive of money-making. No crops that are produced from the soil yield so great profits. The productiveness of small pieces of land appropriated to fruit culture is truly wonderful, and the money results in some cases are so great as to be worthy of the fashionable term of "fabulous."

It is well for the farmer to recollect that some of our fruit crops may be consumed with great advantage and profit by his stock animals. Hogs, sheep, cattle, particularly milch cows, and even horses, may be profitably fed upon some varieties of fruit. It has been asserted by a recent author, that "fruits of all kinds, but particularly what may be called the large fruits, such as are grown in our orchards, may be profitably cultivated for feeding our domestic animals. Sweet apples have been especially recommended for fattening swine, and when fed to cows they increase the flow of milk, or pro-

* See Dr. Flint's *Contributions*; published for the U. S. Sanitary Commission, pp. 18–667.

duce fat, according to the condition of these animals. * * * Orchards have been planted with a succession of sweet apples that will sustain swine in a condition of perfect health, growing and fattening simultaneously from June to November; and the late varieties may be cheaply preserved for feeding stock of all kinds during the winter." The farmer may also be reminded that portions of many farms can be appropriated to the culture of fruits, which are not adapted to crops that require cultivation on arable land. It has even been asserted that a given area planted with fruit trees, will sustain more stock, or fatten more pork, than the same space devoted to grain and forage crops.

I propose to present some facts which will overcome the admitted ignorance referred to in the answer to the first query, Why do not farmers have fruits? In other words, briefly to point out, as a result of long experience and extended observation, *what plants to get, and how to set and tend them.*

The leading classes of fruits will be presented in the order of their importance:

THE APPLE, prince of fruits, will first claim our attention. There is scarcely a farm in the United States where it will not grow, and where some of its very numerous varieties will not succeed. In the extreme north, it may be necessary to resort to varieties of the most hardy character, such as the Siberian, and some other of Russian origin. In the south, many new varieties have originated from seed, which appear well adapted to that region.

Preparation of the soil—Disappointment from bad selections.—Having assigned a portion of the farm to the apple orchard, which sho ld be elevated, and of a light, porous soil, the ground should be well prepared by thorough plowing, if this be practicable, though it is found that fruit trees will thrive in newly cleared land, if set among the stumps; they have been planted on prairie sod, and there are many fine orchards on rocky tracts, where the preparation must be done exclusively with the pick, the spade, and the shovel. It may be the best economy for the owner of such land to appropriate it to the orchard, because it is unfitted for tillage crops. Even the holes for setting the trees may be made with the plow, by simply marking out the surface at the proper distances, and setting the trees at the intersections. This is done after the whole ground has been well prepared by a thorough plowing, and the trees are easily planted in the mellow soil, in which they will thrive admirably. On low and flat lands that have no good natural drainage, tile should be used, if accessible, but even here surface draining may be done with the plow, by throwing the furrows together where the rows of trees are to be set, what the farmers call back-furrowing, two or three times, so as to make a little ridge to plant them on. This will also make open furrows between the rows, that will give outlet for the surplus rain water, or at least lead it away from immediate contact with the roots.

Selection of Trees—Varieties.—Young trees are better for planting than older ones; small ones are more easily handled, and are surer to grow than larger ones. Two years from the graft or bud is long enough for the apple to remain in the nursery. This is true of most varieties, but there are

ceptions to this, for some slow growing kinds require a longer period to tain sufficient size. The plants should be stocky and branched, and they ould be taken up carefully, so as to preserve the roots.

Varieties are so numerous, and tastes so diverse, that it is almost impossible to make out a list of sorts that will be acceptable to all, and besides this is well known that the varieties which succeed in one locality may fail in nother. Every planter should endeavor to ascertain what sorts have been sted and approved in his own neighborhood. Hardy and productive kinds, f second quality, are more satisfactory than those fruits of greater excelnce, which have not these prime qualities of the tree. It is rare that we nd all excellence united in one individual.

For the family orchard it is best to have a succession in the time of ripening. The same is true of an orchard planted for stock-feeding. But in the commercial orchard, where a large quantity of fruit is to be produced for shipping, it is found best to plant only a few varieties, and these should be productive, hardy and of such a character as to bear transportation and to command a ready market, less regard being had to the superior quality as table fruits than in the amateur and family list.

APPLE FAMILY—JUNE TO MAY.

Summer Rose, Primate, High-top Sweet or Red Astrachan, Benoni, Summer Queen, Golden Sweet, Jefferies, Maiden's Blush, Lowell, Rambo, Wagner, Western Beauty, Jonathan, White Pippin, Ohio Pippin, Grimes' Golden, Winesap, Raule's Janet.

Planting.—After the ground has been prepared, it is ready to mark off with the plow in two directions, so that the intersections of the furrows shall come at the stations for the trees. This is the best way to dig the holes, for the furrows may be made quite deep enough. Indeed, it is not desirable to set the trees deeply—some even advocate planting on the surface and covering the roots with a little mound of soil, as is done when the trees are set on top of the sod of prairie or meadow. The distance between the trees will depend upon the habit of the variety. Some will require more space than others, but close planting has many advocates, who advance some cogent reasons for crowding the trees instead of the wide planting of former years. A few of these may be mentioned: In the first place, it is now conceded that the land appropriated to the orchard should be given up to the trees and not be used for other crops; therefore there is less necessity for space between them. In close planting the whole ground is shaded and kept from the baking influence of the sun, and thus remains more loose and friable than where exposed. The crowding of the trees also protects them, in a great degree, from the severity of the cold in winter, and from the injury incident to the sudden changes of our climate; but in exposed situations, this close planting especially shelters them from the trying winds.

The planting should always be done with the greatest care; the roots should be spread out in their natural position, the finest soil put next to the fibres and worked in among them with the fingers, so as to be in immediate contact both below and above them. When the roots are well covered, slight

pressure may be made with the foot, especially toward the end of the ro or, if the ground be dry, a few quarts of water may be poured upon it to tle the soil, and this should be covered with more dry earth. All that por of the tree which was under ground in the nursery must be covered, and fall planting, a little mound should be heaped up against the stem to kee from being swayed by the wind, as well as to turn off the rains from the ro This mound may be removed in the spring.

Cultivation should be thoroughly kept up in the young orchard for a years; and, at first, hoed crops, such as corn or potatoes, may be allow among the trees, but no grain or grass, nor any weeds, should ever be pern ted among them. This cultivation may be continued four or five years, ur the trees are well established and begin to cover the ground with their sha when the spaces between them will be so occupied by their branches as longer to admit the horse and plow. The land may now be laid down clover—not for a hay crop, but simply to cover the surface as a mulch, which purpose it may be mowed and left on the ground.

Training and Pruning.—These topics should be considered togeth since both have the same object—the forming of the head. The tree shou be trimmed early in its orchard life, so as to produce the desired shape. should be branched low, from two to four feet from the ground. The mai limbs should be well balanced and well separated, while the leader must al be preserved; all interfering branches should be removed, and those whic are too strong must be shortened in during the summer. All this will requi some care and watchfulness, but will need the removal of very little wood it be done in time, while the tree is small, and this is the best time to do th work of pruning Midsummer is the best season; a strong, sharp knife an a pruning chisel, the best instruments.

Pruning old orchards is quite another affair; and if they have been lon neglected, the trees may need a very severe pruning to remove crowded, ex hausted and decaying branches, in order to re-invigorate the organism by th production of new wood growth. The application of the saw will now b required, and the mild weather of fall, winter or early spring should b selected for doing the work. All large wounds must be pared smoothly wit the chisel, and covered with some mastic to exclude the elements. In suc trees it is sometimes better to thin out the branches and shorten them than t remove the larger limbs.

PEARS are delicious fruits, and every farmer should plant at least a few trees. The crops are certain and any surplus may readily be disposed of. The old saw about planting "for one's heirs" must give way before the advances of pomology, for we now have many varieties in cultivation that are early-productive, and modern horticulture has furnished us with means of forcing early fruitage upon those varieties that formerly tried the patience of the orchardist by their long continued wood-growth before reaching that condition of maturity that is attended by abundant crops.

The natural season for the maturing of this fruit being mid-autumn, we find, as a result of cultivation and the production of new varieties, that this period

as been considerably extended in both directions, so that the pear season ow reaches from July to March, or even longer. A very experienced student nd propagator of this fruit has suggested that in thus departing from the ormal season of ripening we may expect to find, under the law of compenation, that we shall lose some desirable qualities. The truth of this is a natter of common observation; thus, in quality, most early pears are inferior o those of a later period, and the general inferiority of the latest or winter ears is a matter of common remark. There are exceptions in both extremes, ut autumn is the season of the best pears.

Soil.—Any good loamy land, with a predominance of clay, will produce ood pear trees, and thorough plowing will be a sufficient preparation after raining, if the subsoil be tenacious and wet. The pear strikes its roots deeply into the soil; it is thus able to seek its food, and it is a gross feeder, but may thrive even on thin soils—at the same time it will be benefited by suitable manures. Analysis of its products shows that it needs lime and phosphoric acid; therefore, bones may be applied with advantage to lands that are deficient in these elements. Planting and cultivation of the pear may be the same as that advised for the apple.

Dwarf pears have been very highly recommended and largely planted; but the majority of planters now prefer to have their trees on free-stocks. These are often erroneously called *standards* in contradistinction to those being dwarfed by being worked on quince stocks. The dwarfs are very satisfactory for limited grounds, and should have high culture and good care in trimming and training to produce their best results. The two styles of trees should not be planted together, as has been advised; they require different treatment.

Training.—Pear trees will bear crowding, as most of them are of an upright habit; fifteen or twenty feet apart is wide enough for the majority, and many will succeed much closer. The trees should not be grown as *standards*, with tall, naked stems, but do much better if trained from the first in conical form, when they are generally called *pyramids*. This object is attained by causing them to branch low, and by curbing the upper limbs at both the summer and winter pruning, thinning them out and shortening them in such a manner as to keep the lower branches always the longest; the result will be the desired conical tree, which shall have all of its twigs, fruit and foliage well exposed to the sun and air.

Culture and Pruning.—The pear orchards may be treated like those of the apple, excepting that the general habit of the former is pyramidal and of the latter globular, so that the pruning will require some modification, though conducted upon the same principles. While young, the ground among the trees should be well cultivated, but after they have attained some size (after six or eight years) they are found to do better in grass than if the cultivation be continued. These remarks apply to the pear upon free-stalks, but those trees that are dwarfed upon the quince or by severe and continued root-pruning will require high culture and even manure.

A select list of pears for family use from June till December:

Windsor, Early Butter, Doyenne d'Eté, Rostiezer, Tyson, Dearborn, d'Amalis, Bartlett, Flemish Beauty, Golden Butter, Autumn Melting, Sheldon, Duchesse, Beurre Diel, Figue, Vicar, Passe Colmar.

PEACHES are always acceptable, easily grown, and they come into fruiting at an early age, generally the third year. Unfortunately they are not constant bearers, as the flower buds are often injured by the severity of winter or by spring frosts. Peach trees will grow on almost any soil, but light sandy or gravelly lands and elevated situations seem best adapted to them. The trees should be one year old from the bud, cut back to a bare stem, about two feet long, before planting. They should be set from fifteen to twenty feet apart in the orchard, planted in the spring, and the ground must be cultivated continually to secure the best results. Mounding the tree has been advocated, but it is an expensive operation, the merits of which have not yet been fully demonstrated. There is a great variety, both in its color, flavor, consistence and season. There are clings and free-stones of all colors. The former are the best, the latter are most popular. The season extends from the first of August until the middle of October in this latitude. Those which ripen earlier or later are of less value.

The following lists are given under their classification:

FREE-STONES.

***White-fleshed.*—Early Tillotson, Early York, Hale's Early, Large Early York, Morris' Red, Old Mixon, President, Red Rareripe, Stump the World, Ward's Late.**

***Yellow-fleshed.*—Barnard, Bergens, Columbia, Crawford's Early, Crawford's Late, Red Cheeked Melocoton, Smock, Yellow Rareripe.**

CLING-STONES.

***White-fleshed.*—Baltimore Rose, Grand Admirable, Heath Cling, Large White, Old Mixon, Rodman's Red.**

***Yellow-fleshed.*—Lemon Cling, Orange Cling, Tippecanoe, Washington.**

***Deep Red Flesh.*—Blood Cling or Claret, Blood Free.**

THE PLUM is so sadly affected by the Curculio, that few of us know how excellent a fruit this is. Occasionally the rascals stand back, and thus we get a crop, and some cultivators have succeeded in counter-working the enemy so as to preserve their fruit. Trees planted in trodden places near houses have escaped the attacks of these insects, and have borne crops for many years, so that farmers are urged to continue planting plum trees in such situations. There are some varieties, however, which appear to escape these invaders, among them the little Damson, which is well worth cultivating, as it makes good preserves.

The following select list is recommended for those who would plant plums:

Early Orleans, Lombard, Green Gage, Prince's Imperial, Reine Claude de Bavay, Yellow Gage, Washington. Coe's Golden, Smith's Orleans, Damson.

CHERRIES.—This delicious fruit appears to be more fastidious as to soil than any other, for though it will grow almost anywhere, it does not stand well on our rich limestone lands. Those soils that are natural to the chestnut appear to be the most suitable for cherries.

There are some very hardy varieties that seem to do equally well on any kind of land; these are called the *Dukes* and *Morellos*. They are mostly sour and are chiefly valuable for cooking cherries. May be planted ten, fifteen or twenty feet apart, according to their class, as Morellos, Dukes, or Hearts and Bigarreaus, the last being the largest. The trees should not be too old when planted—two or three years from the bud or graft is enough. They should be headed back so as to branch low, and should be grown as pyramids. All the pruning should be done while they are young, as they do not readily heal over the stump of a large limb. These trees are very apt to split and burst their bark, especially where the stems are exposed to the sun by trimming them up as standards, hence the importance of low heads. This accident is most common in the free growing kinds and in rich soils.

The following varieties are worthy of culture:

Heart Cherries.—American Heart, Governor Wood, Black Tartarian, Coe's Transparent, Doctor, Purple Guigne, Black Hawk, Black Heart, Burr's Seedling.

Dukes.—May Duke, Belle de Choisy, Belle Magnifique, Carnation, Louis Phillippe.

Bigarreaus.—Elton, Cleveland, Recheport, Yellow Spanish.

Morellos.—Common. Early May, English, Kentish, Early Richmond.

QUINCES have been too much overlooked by our farmers, who could not present their families with a more acceptable offering than the fruit from a few trees planted in some low spot of rich, moist soil, such as that which receives the slops and drainage from the dwelling house.

These trees are rather hardy and will occupy little space, as they never grow large, and can be planted eight or ten feet apart. They should be trained to one stem, branched about three or four feet from the ground, and kept trimmed to open heads. The common variety is the *Orange*, which ripens in September, while peaches abound. The *Portugal*, or pear-shaped, and the *Angers* have smaller fruits, which ripen later—in all October. The largest fruit is *Rea's Mammoth* or *Coxsackie*, recently introduced and very highly recommended.

GRAPES.—Every farmer, every cottager, every householder or houseruler should plant a few grape vines. It is a very simple affair, requiring no great amount of skill nor labor to plant, train and trim a grape vine, and its productiveness of fruits, that every body, young or old, can appreciate, is proverbial. Who has not heard of the famous grape cure? Who can object to trying it? Certainly not he who has planted and trained his own vines.

Almost any soil that has been deeply loosened and moderately enriched will cause the grape vine to grow luxuriantly. It may be set in out-of-the-way places, trained to a stake or a trellis, or be made to climb beside the walls of out-houses and cover their bare sides with foliage and fruit, rendering them ornamental instead of ugly.

Training the young vines in an upright direction to encourage their growth, and at the same time concentrating their force into one or two shoots by pinching or rubbing out the others, is a very simple affair and light labor. Pruning them when dormant, cutting them back to two or three eyes in the fall or winter, is no great mystery. The same process of training two strong shoots the next season is but a repetition of the first summer's experience, with

mor satisfactory results; and the second fall, with canes nearly as large as the little finger, the pruning is less severe, because we now have bearing wood, which needs to be shortened-in two or three feet in a strong vine. These canes are to be trained horizontally, as the arms of the vine, in which condition they may be left for years, unless they need renewal. In the third and all succeeding years, we must still train the shoots upward, taking care only to remove the superabundance of the growths, by rubbing out early in the season and leaving one shoot, say, every nine inches, which must be trained upward. In the fall of this year we commence pruning these shoots for alternate production of fruit and wood, by cutting one cane about two feet long and reducing the next, the weaker, to a spur with only two eyes or buds. In this way, the bearing wood of the vine is constantly renewed. The mystery disappears when we recollect that all the fruit of the grape vine is produced upon green shoots that grow from the cane of last year's growth. By renewing these shoots annually from below, we can have bearing wood to cover the trellis, and strong new shoots to clothe the whole with abundant foliage. Various modifications of pruning and training have been suggested and may be practiced, but the most simple, common and successful is the one indicated above. All depend upon the annual reproduction of new wood from which to draw our supplies of wood from year to year.

In the multitude of grapes that are now offered to the public, almost any tastes may be gratified, and yet for the most satisfactory, because certain results, we are safe in selecting a few well known varieties that we can recommend to our farmer friends:

Hardy and productive—Concord, Hartford, Ives, Clinton, Martha (white).
Not always healthy—Creveling (very good), and Catawba.
Juicy grapes, very best—Delaware, Iona, Israella, Isabella, Diana, Herbemont, Alvey, Elsinboro.

SMALL FRUITS.

We now come to the consideration of the *small fruits*, which, however, may constitute a very large share of the food, comfort and luxury of a well regulated family, either in the country or city, and which will contribute in no small degree to the healthiness of the people, by substituting their grateful acids and sweets for the calomel, ipecac, tartar, soda and potash, in various forms, that are so freely drawn from the druggist's shelves, either for the cure or production of disease, according as they are administered by the doctor, or by the cooks.

THE STRAWBERRY comes first in the order of the season, and indeed it is the most univesally welcomed and relished of them all. The cultivation of this fruit is so simple, and the returns so speedy and so grateful, that it should occupy a prominent place in every farmer's garden. This fruit will grow in almost any soil, but a good stiff loam, well stirred, is probably the best. The strawberry plants should be well rooted runners, or offshoots from an older plantation; they should be taken up carefully, so as to have good roots. If these have been formed in small flower-pots sunk near the parent bed, so much the better, as the fibres, being confined by the pot, will be less disturbed in transplanting—or the ball may be set entire.

Strawberries may be grown in hills, in rows, or in beds. The latter is the common method, and the beds are formed by planting two or more rows a foot or fifteen inches apart, setting the plants twelve inches one from another in the rows. In the beds, the runners are allowed to grow, and to increase the number of plants indefinitely, so that they are often injured by being crowded too closely together. When planted in hills, they are set eighteen inches apart; the space between them is kept perfectly clean, and the runners are cut as soon as they appear. This results in the greater growth of the original plant, which has an increased number of crowns from which the blossoms and fruit proceed in great numbers. This method enables the producer to have the best possible results in the size and appearance of his fruit, but it is attended with more labor and expense than the bed system. Many cultivators prefer planting in rows, when they set the strawberries about a foot apart, and place the rows two feet or more one from another, according as they expect to use plows or hoes in their culture. In the narrow rows the runners may be cut off, and the fruit will be almost as fine as that grown in the hills, but in the wider rows the runners are generally allowed to strike root, and spread the row into a bed in the course of the first summer after planting.

Spring is the best time for setting out the plants, though this may be done at any time during the growing season. The advantages of early planting are the longer period allowed for the stools to grow and become thoroughly established in the soil. The plants are set by the line, a hollow is opened with the trowel, in this the roots are spread out, then covered with mellow earth and pressed firmly with the fist or even with the heel. If watered at once, a little fresh earth should be thrown in to prevent the cracking, but great care must be taken to avoid placing the crown below the surface of the ground—in other words, the roots must be planted and not the corm, from which the crowns arise. Thorough culture should be given through the season.

Mulching, with old rotten manure, applied after planting, will encourage the growth of strawberries, and keep the soil moist. Winter mulching with clear straw, leaves or other material, should be liberally applied after the ground has frozen, and be left to protect the buds during the winter, and to be removed from the crowns of the plants in the spring. Being left between the rows, the straw will make a good summer mulch, and keep the fruit clean. In hill culture, saw dust and old tan bark have been recommended, and still another material, spent hops from the brewery, has been used with excellent effect.

Strawberries have a peculiarity in their blossoms, from which they have been classified as *Pistillates*, *Staminates* and *Hermaphrodites*. In the first class, the stamens are so defective that the flowers need the fertilizing influence of other kinds, which must be planted near them. These furnish many of our favorite varieties, especially those which are largely cultivated in beds. The next class embraces most of those sorts which produce the largest berries; their flowers are often so deficient in the pistils that a large per centage of them fail to set fruit. This is particularly the case when these varieties

are grown in beds and allowed to multiply their runners. They are, however, quite productive when cultivated in hills, and they have formed branching crowns from which spring numerous trusses of flowers. Besides these two classes there is another, in which the two sexes are so evenly combined that almost every flower is followed by perfect fruit. A very few varieties of the strawberry either cultivated or wild belong to this group. These different classes will be indicated in the list by the letters P. S. and H.

Agriculturist, H.; Austin, S.; Burr's New Pine, P.; Dr. Nicaisse, S.; Extra Red, P.; Fillmore, P.: Golden Seeded, S.; Hovey's Seedling, P.; Jucunda, S.; Longworth's Prolific, H.; Necked Pine, P.; Russell, P.; Superior, P.; Triomphe de Gand, S.; Victoria, S.; Washington S.; Wilson's Albany, H.

RASPBERRIES.—Next to the strawberry, and nearly allied to it in its botanical relations, is the Raspberry, which furnishes a fruit of high flavor and exquisite fragrance. It is no wonder that this should be a favorite with all fruit growers, since it is easily produced, hardy, makes quick returns, is easily gathered, and commands a ready sale at high prices. And yet it is equally surprising that so few farmers' gardens are stocked with the raspberry.

Every soil that is cultivable will produce this fruit, but a good loam is best adapted to it. The only preparation requisite, is ordinary plowing of the land, but deep cultivation and manuring are well bestowed upon the raspberry patch, and it should be kept clean by thorough summer cultivation.

The raspberry may be planted in the fall, but the early spring is generally preferred. They may be set about three feet apart, in rows that are from six to nine feet wide, or planted in hills five by five feet, or wider for some of the larger kinds. Planting in rows is usually preferred, but the hills allow of cultivation in both directions, or cross plowing, which saves hoeing, and also permits the pickers to get among the plants more readily.

Trimming the raspberry was formerly done only in the winter, and consisted in shortening the canes, and removing the old dead wood, and the surplus feeble shoots, so as to leave from two to four on each plant or hill. This was done at any mild time between October and February or March. Fall pruning, if done too early, may prove very injurious, if followed by mild growing weather that causes the buds to grow, and thus destroys a portion of the next year's crop. Of course, it is understood that all the varieties and species of this genus, *Rubus*, including the raspberry and blackberry, produce shoots one year that become the bearing canes of the next summer, and then die; an apparent exception exists in the autumnal bearing raspberries, which produce blossoms and fruits upon the shoots the season of their growth.

Summer pruning is now practiced by all good cultivators. This is a very simple operation, and consists in pinching or cutting off the shoots as soon as they are two feet high, which causes them to branch out with strong laterals, and these are to be cut back according to their strength, in the winter. By this means the plants are made more stocky and bushy; they resemble little trees, and are able to bear enormous crops. At the same time, all redundant branch shoots are to be cut away. This method also obviates the necessity for any

kind of support, such as stakes or trellis, since the sturdy plants are able to stand alone.

We have two American species of eatable raspberries, the *Strigosus* or red fruited, and the *Occidentalis*, or thimble berry, the black caps. Besides these, the European species, the *Idæus*, furnishes many delicious raspberries, most of which are tender and need winter protection:

Black Caps.—Thornless, Doolittle. Miami, Purple Cane.
American Reds.—"Red Antwerp," Kirtland, Clarke, Philadelphia.
Foreign.—Red Antwerp (true), Brinkle, Hornet, Pilate, Franconia, Naomi (new).

BLACKBERRIES.—The blackberry, though abounding in most parts of the country, is entirely deserving of care and cultivation. In the garden it is under our control, and may be allowed to reach perfection, by hanging until perfectly ripe, which is not the case that must be yielded to the "eminent domain" of any vagabonds who may come along and trespass on our farmers, and glean the fruit from our neglected fields and fence-corners.

Any rich, deep soil, well plowed, will suit this fruit. The plants should be allowed plenty of room, and may be set every four feet, in rows eight or ten feet wide. The ground should be well cultivated, or deeply mulched, and the suckers must be kept down, by cutting them with the hoe whenever they appear between the rows, and these should not be crowded—one stalk every two feet will be sufficient. This being only another species of the genus *Rubus*, or bramble, the remarks as to the habit, and pruning of the raspberry are applicable to this species, and need not be repeated, except that the summer pruning should be practiced a little higher, say from three to four feet, according to the vigor of the plants, and the redundant shoots must be cut off.

Black.—Dorchester, Thornless, New Rochelle, Wilson, Kittatinny, Missouri Mammoth.
Light colored.—Crystal (white), Orange (rose).

THE CURRANT.—In almost every log cabin garden we used to find this health-giving fruit, which offers its agreeable acid in the heats of summer as an antidote or preventive of the billious effects of our torrid season. And yet the currant is a sadly neglected fruit, and in many parts of the country there is not enough for home consumption.

This being a northern plant, it is thankful for a partial shade or protection from the scorching sunshine (in latitude forty or southward). For this object it is well to plant the bushes on the north side of a fence or building, and even in the shade of young orchard trees, where they sometimes succeed very well for a long period, even after the apple trees have occupied and shaded the whole surface.

The currant delights in a deep, rich loam, and will thrive even where the soil is somewhat moist. The bushes should not be crowded, as they require about four feet space, each way.

Trimming is to be done in the fall or winter, as the buds swell very early in the spring. It should consist in shortening two or three of the strongest young shoots, cutting away all the weaker ones, and removing only the oldest and exhausted bearing wood. Unlike the raspberry, currants do not fruit on

the young shoots, but upon little spurs that appear only on branches that are two or more years old.

The plantation must be kept clean, and free from grass and weeds. After cultivation in the spring, it is a very good plan to cover the soil with a heavy coating of old hay, straw, fodder, leaves, or other suitable mulching material, which will retain the moisture, and preserve the fruit a long while in fine condition.

VARIETIES.—Common Red, Red Dutch, White Dutch, White Grape, Versailles, Cherry, Black Naples.

GOOSEBERRIES.—Fashion has wonderfully affected the production of this fruit. The fine, large, English varieties were generally so badly affected with a mildew, that their culture was abandoned, except by a few fortunate persons. The introduction of the Houghton, and American red varieties, worked a revolution—everybody planted them, and everybody purchased them at high prices for several years; when lo! the cost of sugar caused a change, and the demand fell off to such an extent that the plantations were rooted up, and there was no longer any sale for the plants, and nurserymen discontinued their propagation. Gooseberries are just as valuable, nevertheless, to the farmer's family as ever they were, and their cultivation is so simple that they may and should be grown in every household garden, and by every cottage.

RELATION OF CHEMISTRY TO AGRICULTURE.

BY PROF. A. P. S. STUART, OF THE ILLINOIS INDUSTRIAL UNIVERSITY.

In attempting to trace the relation of chemistry to agriculture, it may be well to inquire, first, what chemistry is, and, secondly, what agriculture is. Briefly, then, chemistry is the science of the elements. It isolates them, and teaches us their properties, their mutual relations and affinities, the changes which they undergo under different conditions, and the new bodies formed when two or more of them combine, by the action of chemical force. These elements and their compounds, which are infinite in number and in the variety of their forms and properties, their mutual relations, and the changes which they uudergo by their reactions on each other in the inorganic and the organic kingdoms, constitute the field of chemistry.

Secondly, what is Agriculture? It may be looked at from two points of view. It may be considered either a science or an art, and both, as yet, in an imperfect state. As a science, it is concerned with the conditions and laws of vegetable growth; as an art, it is, or should be the practical application of the science, in such a way as to obtain the most abundant harvests. In a broader sense, it includes also the raising of some or of all kinds of domestic animals, and in this respect chemistry sustains a most important relation to agriculture; but for our own purpose we shall not consider this view, but confine ourselves to the relation of chemistry to agriculture as a means of raising the best crops.

We shall accomplish our object best, perhaps, by considering the conditions essential to the healthy development of plants, and in what respect chemistry

is related to these conditions. And, first, we may inquire, Do all plants require the same conditions for their healthy growth? A little reflection will teach us they do not. Tropical plants will not flourish so well in cold as in warm latitudes, nor will the same species of plants flourish equally well in all soils in the same latitude. Are we then called on to study the conditions peculiar to each individual species? If so, our field of inquiry widens at once into an immense expanse. For the purpose of the farmer, however, it will be sufficient to consider the conditions of those plants in the cultivation of which he is expending his labor and capital. In this State, for instance, Indian corn, the cereal grains and the various fruits and roots are the plants in which he is chiefly interested, and the conditions of whose growth he is especially called to study. We shall accomplish our object on this occasion if we confine our attention to a single species.

The question then recurs, what are the conditions most favorable to the healthy development of plants? For it is by an analysis of these conditions that we shall best gain a clear idea of the relation of chemistry to agriculture. A careful study will teach us that these conditions are of a twofold character. Plants are conditioned by the objects that surround them and furnish them their food, as soil, moisture and the atmosphere; and, secondly, by the forces which act on these substances, as heat, light, electricity, chemical force, magnetism, capillary force, and probably other forces with which we are but imperfectly acquainted. In other words, we have to study the elements of which plants are made; and, secondly, the forces which act on and build up these elements into organic structures. Moreover, all these conditions must exist at the same time, and in the proper degree, that plants may flourish. Soil must be present, of the right kind and in the right quantity. The same is true of moisture and the atmosphere. The necessary forces too must act, and with the right degree of intensity. No single substance or single force would suffice to make a plant. Carbon or charcoal is an essential element in the structure of every plant, but carbon alone could never make a plant, whatever forces might act on it. The same is true of every other element. Heat is a physical agent indispensable to vegetable growth, but heat alone could never produce a plant. In fact, all the elements required by plants, and all the forces necessary to weave those elements into cellular tissue and other organic compounds, must be present at the same time, constituting a kind of complex condition in which a nice adjustment of material and force, the web of the vegetable organism, is woven. Nor is it difficult to see that, of all the conditions within which plant-life is possible, and the range is very wide, certain conditions will be more favorable to its development than any other, and that under these a plant will attain its maximum growth, and mature the most and best seed.

But it must be observed that of these conditions, some the farmer can modify, others not, or only partially. Soils can be modified in quality by adding substances which they do not contain; in texture, by loosening or stirring them by various mechanical means, and by allowing organic matter, like stubble or green crops, to decay in them. In thus modifying his soils lies the chief

power of the farmer to increase his harvests. The quantity of moisture, also, is in a measure under his control. When present in excess it can often be removed by drainage, and when scanty it can sometimes be increased by irrigation; but long continued rains or drouths, causing wet and dry seasons, are, for the most part, beyond his control. It is not denied that climate can sometimes be modified by man, so that districts generally dry may receive rain sufficient for ordinary vegetation; but this, even in cases where it is possible, involves agencies extending over a considerable period of time. The atmosphere, too, is a necessary agent in vegetable growth, but the proportion of its gases, with some slight exceptions, cannot easily be modified by man. The physical agents, heat, light, electricity, magnetism and chemical affinity, play a very important part in plant-life, and, although they can be transmitted into each other, so that a given quantity of heat can evolve an equivalent quantity of electricity, and this electricity a corresponding quantity of magnetic or chemical force, and although these forces (if, indeed, they be more than a single force under different phases) may, in their relation to vegetable growth, lie much more in the power of man to modify than has been supposed, still that farmer would be sanguine who, in the present state of knowledge, should think to exercise more than a limited control over these capricious agents.

Thus far we have stated only the general conditions of plant-life, and how far the agriculturist can modify them. We come now to examine these conditions more closely, and to inquire how chemistry is related to them. As already stated, they are of a twofold character. They involve matter and force. First, then, the matter of plants. Our inquiries on this head are embraced in three questions. First, of what are plants composed? Secondly, whence is it derived? and, thirdly, in what form is it taken up by plants? All of these questions are of a purely chemical nature, and it is here, therefore, that agriculture and chemistry occupy common ground, or rather agriculture employs chemistry to solve its problems. If agriculture asks of what plants are composed, chemistry answers by analyzing them, and showing that they are made up of certain so-called proximate constituents, as cellular tissue or cellulose, starch, sugar, gum, pectine, resin and organic oils and acids; also, gluten, albumen, caseine and organic bases, etc.; that some of these constituents, like cellulose, are common to all plants, that others, like the alkaloids, strychnine and brucine, are found only in a few plants, while others, like starch and sugar, etc., are found in many plants, but in variable quantities. If agriculture inquire further, of what these constituents are composed, chemistry answers by resolving them into their elements, and teaching us that, as a whole, they are composed mainly of fourteen of the sixty-three known elements, viz.: oxygen, hydrogen, nitrogen, carbon, sulphur, silicon, chlorine, phosphorus, potassium, sodium, magnesium, calceum, iron and manganese; that some of the constituent, like cellulose, starch, sugar, etc., consist of only three elements when pure, viz.: oxygen, hydrogen and carbon; that others, like some of the vegetable alkaloids, consist of the same elements, with nitrogen superadded; that these three or four elements constitute the great mass of matter in plants, and that the other elements in plants are

found there in relatively small quantities, and these even very variable in different species.

But, besides these fourteen elements, which can be detected in most plants with comparative ease, chemistry detects others which exist there in very minute quantity, so much so as to escape the ordinary means of observation. It is only recently that, by improved methods of analysis, the rare alkaline metals Lithium, Calcium and Rubidium, have been discovered in the ashes of plants. In fact it is as easy now to find lithia in the ash of a cigar, as it was formerly to find potash in the ash of the grape, the sugar cane, the beet or the cereals. Fluorine is another element of which traces have been found in the ashes of certain plants, and it is suspected of being in most plants, although in so small quantity as to escape detection. Iodine and bromine are found in sea plants; possibly they exist also in other plants. The strong family resemblance of the elements chlorine, bromine and iodine, and the circumstance that they are almost always associated in nature, and the fact that chlorine is usually found in plants, leads to the suspicion that possibly iodine, and perhaps bromine, may be there too, in extremely small quantity.

Small quantities, too, of lead, zinc and copper are said to have been found in the ashes of certain specimens of the beech, birch and fir; and tin, lead, zinc and cobalt in the ashes of the oak. The ashes of a certain violet are said to contain so much zinc, that places where it grows are selected for opening mines of zinc. Alumnium is found in the lycopodium, and perhaps some other plants.

Fourteen elements, then, exist in most plants in sufficient quantity to be easily found; three or four of these make up the great bulk of the plant, the carbon constituting, in wood dried at 150° centrifugal, about one-half the weight, the ashes from ½ to 1½ per cent., and the rest being oxygen, hydrogen and nitrogen, the first two in nearly the ratio to farm water, with usually a slight excess of hydrogen. The nitrogen averages about one per cent. In addition to these fourteen elements we find one or more of fourteen others in a few plants, in almost infinitesimal quantity, and the number will probably be increased hereafter.

The question arises whether all these elements are absolutely necessary to the growth of plants. Some, we know, are. A plant could not exist without oxygen, hydrogen, nitrogen and carbon, any more than a building could exist without solid materials, like wood, bricks or stone, or the animal without bones and muscles and the materials of which to make them. The same is true, to a considerable extent, of potash, soda, lime and magnesia, and iron and phosphorus. It was a question, some years ago, whether these inorganic constituents were necessary to the growth of plants, and prizes were offered, by societies interested in the subject, for a satisfactory solution of the problem; and it is now a fact, as well established as any in agricultural chemistry, that plants cannot thrive without them. They are a necessary part of the food of plants, and perform functions which make up an essential part of the life of plants.

But how is it with those elements which are found only in very small quantity? Is their presence necessary, or merely accidental? Have the plants absorbed them in some such way as a person sometimes takes harmless or even poisonous substances, by mistake? It certainly is not safe to conclude that their influence in the processes of life is commensurate with the quantity in which they are found, because no fact is more certain than that very small quantities of substances are sometimes very beneficial, and sometimes very injurious—even fatal—to the life of animals. Why may not the same be true of plants? The probability is that no substance, even in very small quantity, can enter the circulation of a plant without modifying, in some way, the processes of life, and imparting to it properties and impressing on it an individuality which it would not have without it. A substance naturally foreign to a system, and even poisonous to it, may, if taken in sufficiently small quantity, not only modify some function without becoming fatal, but create a necessity for its presence, so that life, even, would be endangered without it. The eating of arsenious acid is a case in point. A person may acquire the habit of taking daily a quantity of arsenic, which, at first, would have proved fatal; but when the habit is formed then it must be continued: that is, the arsenic has either created a function, or so modified existing ones as to make its presence necessary. And something similar is doubtless true of plants. Different soils contain small quantities of different substances, which, absorbed by plants, may prove beneficial or injurious to their development, and may have their influence, among other causes, in producing those peculiarities so noticeable in the same species of plants. Why is it that clover, manured with gypsum, is so different from that manured with something else, in the size of its stems, leaves and flowers, as almost to be considered a different species?

But let us return to the elements. Each one of them has certain properties, which are peculiar to it and which distinguish it from every other element; and these properties vary, either in kind or degree, with every change of condition to which the element is subjected. Four of them—oxygen, hydrogen, nitrogen and chlorine—are gases at ordinary temperatures, and the first three have resisted all efforts to condense them to liquids. They are, in the free state, permanent gases. Fluorine should probably be added to the number, although so little is known of it, in the free state, that little can be said of it. The rest, with the exception of bromine, which is a liquid, are solids. In their affinities, or their tendency to combine with each other, these elements are very unlike. Some, like nitrogen, are of an indifferent nature, manifesting scarcely any disposition to combine with other elements. Others, like oxygen, have an active nature. They are strongly inclined to combine with others. Every case of ordinary combustion is an example of energetic combination of oxygen with carbon and hydrogen. The same process, or a similar one, takes place more quietly in decay. In these cases oxygen acts as a destroyer. But it is equally efficient in building up. Indeed, oxygen presents the singular anomaly of an element ever busy in building organic structures, and then, as if dissatisfied with its work, of pulling them down, and

their ruins building new ones. It is this element, more than any other, causes that ever-recurring cycle of change from life to death and from th to life, which is going on about us; and it is impossible to have an ac-te knowledge of the processes of vegetable growth without a thorough wledge of this element. Possibly, with such knowledge, one may not be to understand vegetable growth, but it certainly cannot be understood hout it.

hen placed in peculiar conditions, these elements assume properties dif-nt from those which they usually manifest. Thus oxygen, exposed to stances undergoing oxidation, or to the electric spark, or to the galvanic rent, assumes properties so unlike those which it usually has, as to appear be a new element. In this state it is very energetic, combining even with e elements which usually resist oxidation. It is possible, even probable, t the nitric acid of the nitre beds owes its origin to this energetic kind of gen; and it is possible, too, when the relations of this substance to vege-on shall have been more studied, and better understood, that it will throw r light on the chemistry of organic life. The influence of this powerful nt in the interior of the plant can easily be conceived to be very great, and field here for investigation, therefore, is very inviting and promises a rich ard. Other elements, by a change of condition, may indicate a change of r properties. For instance, sulphur crystallizes in two entirely different ms, according to the temperature to which it is exposed. The same is true any other elements. Why it is so we cannot tell. But it is easy to con-e, in fact it is difficult not to conceive, that the function of an element he vegetable economy will vary with its changing properties. These new perties, peculiar to certain conditions, often gradually disappear after the itions cease in which they were induced. Elements in this state seem to n a kind of unstable equilibrium, and ready to revert on the slightest oc-on to their normal condition: like a wheel with an axis not exactly in center, always tending to a state of rest with the heaviest part down-d. These peculiar properties, which the elements manifest, on the normal for the conditions in which they were induced; and were those condi-s the ordinary instead of the exceptional ones, then these exceptional and table properties would become the permanent and normal ones. Chemis-thus teaches us an intimate relation between the properties of an element the conditions in which they were induced. They stand to each other in relation of cause to effect, a fact which he should do well to bear in mind study its significance; for it is a type which finds a fuller exemplification he higher forms of vegetable life. The importance of an accurate knowl-e of the properties of the elements concerned in vegetable growth is mani-. The more accurate and profound it is, the clearer will be our insight the processes of life and the more will our views and theories be likely be in conformity with truth.

ut if a knowledge of the elements is important, that of their compounds ill more so, for it is mostly in the form of their compounds that the ele-nts are introduced into the plant; and it is through the reactions of these

compounds on each other in the interior of the plant, under the acti chemical affinity, modified by heat, light, electricity, etc., that all the di organic compounds are elaborated. If we would trace them, step by s the changes that take place in the plant—and understand them, be able to anticipate and predict them, we must know accurately the properties substances that come into play. We must know the changes which properties undergo under different conditions, and the effect produced b varying intensities of the different forces. It will at once be seen tha subject is a complicated one. It is a problem in which all the quantiti variables. But its difficulties will not be in vain if they impress the st with a sense of their magnitude, and nerve him to corresponding effort. is only the fatal delusion of thinking we understand a subject, when we penetrated scarcely beneath its surface, that will effectually prevent all gress. Of one thing we may be assured, that no superficial knowledg simple gleaning of an idea here and another there, will ever extend the li of this field of knowledge. Patient and persevering study is required t derstand what has already been accomplished, and he who shall gr successfully with the difficult questions yet to be solved will not only c a benefit on mankind, but give the clearest proof of an intellect of the h est order and of the severest discipline.

The next question is, whence are these elements derived: that is, when plants get their food? There are only two sources—the soil and the at phere—from which they can come, for these are the only objects, so far a know, which sustain any relation to plants with respect to nutriment. how shall we know whether the atmosphere furnishes plants with f Evidently by analyzing it and ascertaining, first, whether it contains the ments that plants require, and secondly, if so, whether it really furnishes t elements to plants. As a matter of fact, the atmosphere consists of elements: oxygen, hydrogen, nitrogen and carbon—the identical ones constitute the great mass of matter in plants. These elements exist partl the free and partly in the combined state. Oxygen and nitrogen in the state make up the great bulk of the atmosphere, in the ratio of about volume of oxygen to four volumes of nitrogen. This mixture of gases tains variable quantities of aqueous vapor and small quantities of carb acid and nitric acid and ammonia. Such is the constitution of the at phere. Now, does it furnish plants with any of these substances, as f Experiment teaches us it does. The very first step in the development o embryo of the seed is accompanied with the absorption of oxygen from air diffused through the soil; and when the plant has become sufficie developed, one of the chief functions of the leaves is to absorb carbonic from the atmosphere. It has been, and is yet, perhaps, a question, wh nitrogen, in the free state, is assimilated by the plant, or whether it enter plant as a compound, in the form of ammonia or nitric acid. In either it comes originally from the atmosphere—the only difference being, it e the plant in the former case as an element, in the latter as a compound.

But if the atmosphere furnishes plants with food, may not the soil do well? We learn, from the analysis of the plant, that it contains certain

ituents; and we learn, from experiment, that these constituents are tial to its healthy development. The plant cannot thrive without them. are therefore essential to the fertility of the soil; for the soil is the only from which a plant can get them. This brings us to the Chemistry of , and on this subject we have this question: Can Chemistry ascertain tely the composition of soils? The answer to this question will depend much on what is meant by composition of soils. If we include, in the those infinitely small quantities of substances which must be estimated e thousand or the ten thousand millionth part of the soil, then it must nfessed that the task would be both difficult and expensive; and yet, very small quantities of substances often have great influence on the th of plants. I cannot better illustrate this fact than by referring to weeds. They contain iodine. In fact they are the only source of the e of commerce, and they obtain this iodine from the sea-water. But the ity of iodine in sea-water is so small that it cannot be detected by any n re-agent, without evaporating a large quantity of water, although ne is one of the most easily detected of the elements. When in solution e amount of not more than 1-800,000, it is easily detected by the usual ents. Now, if one hundred cubic feet of sea-water be evaporated down e cubic foot, not a trace of iodine can be found by the ordinary tests. shows how minute the quantity of this element must be in sea-water; yet the fuci and the algæ absorb a considerable quantity of iodine, and to this element, probably, an individuality which they would not have out it. Lithia, too, one of the alkalies, has been found in sea-water taken the middle of the Atlantic ocean, but it was necessary to evaporate some teen hundred cubic feet to find it. These facts will give some idea of the and expense accompanying the detection of these very small quantities stances. At the same time, with the means of research now at com-, very small quantities of the alkali and the alkaline earths can be ted, with far greater ease and accuracy than was possible ten years ago. mixture of these, weighing not more than a few thousandths or even a onth of a milligramme, they can all be detected with ease at the same . In this way it has been found that lithia, which was formerly thought e exceedingly rare, is very widely distributed in nature, being found in three constituents of many granites, in limestones of different geological ations, in the spring water issuing from these formations, in the ashes of s that have grown on soils formed by the disintegration of these rocks, e blood, the milk, and even the muscles of animals that have fed on these . We conclude, then, from what has been said, that it is possible to in a soil exceedingly small quantities of these substances essential to the thy growth of plants, but that there is a limit at the same time, even the aid of the spectroscope, beyond which it would not be advisable or ticable to go. In our general estimate of the value of chemistry, as a ns of ascertaining the composition of soils, we must bear in mind that a analysis of to-day is a very different thing from what it was ten years

ago, and that as the means of investigation become more accurate, the valuable will chemistry become in its relation to agriculture.

But if chemistry can ascertain with great accuracy the composition o soil, it is still necessary to begin with the analysis of the plant, for how can we tell whether a soil is suited to the growth of a plant? Dif plants vary in the quality and relative quantity of their constituents, soil that is fertile for one plant may be barren for another. He, then who analyzes a soil without analyzing the plant to grow on it, or at knowing its composition, fails to see the relation of the one to the The plant, then, must be the starting point. And to illustrate, let us the wheat plant; and let it be a perfectly healthy, well developed formed under the most favorable conditions, and of such a kind as we like to see our fields covered with. We analyze it carefully, and ascert its composition. We thus learn what materials are necessary to make a plant, and at the same time what materials a soil must have to produce wheat. The soil may have other materials in great abundance, that co ute little or no food to the plant, and these materials may be very unli different soils—in fact they generally are; but the soil must contain, a indispensable requisite to fertility, those substances required by whea food. We do not say that a soil containing these substances will neces be fertile, but we do say that it cannot be fertile, for wheat at least, wit them. Their presence is one of the conditions of fertility, and but one they are present in such a state as not to be available to the plant, they well be absent, for the plant can derive no benefit from them, and such i case when they are locked up in undecomposed minerals, like feldspar etc. Fertility, then, implies not only the presence of elements require plants as food, but their availability as such.

If, now, we examine more carefully the analysis of the wheat plant shall find the number of constituents derived from the soil comparat small, at least those which need to claim our attention. For there are constituents of wheat that are furnished by all soils in sufficient quantit healthy growth; such, for instance, are iron, manganese, soda, silica and we may add, probably, magnesia. But there are others that are n ways present in sufficient quantity for the wants of the plant. Among may be mentioned potash, lime, phosphoric acid, and, perhaps, some magnesia. The number will not usually exceed five or six.

Now, a soil that does not contain these substances is barren for whea it had them once, and has been deprived of them by wheat raised many years in succession, it is now, for the purpose of wheat culture, n ter than if it had never had them, and a farmer might just as well tu sheep into a field of weeds or of sand, and think to fatten them there, sow wheat on such a soil and think to get a good crop. What, then, is done in such a case? Why, evidently, give the plant what it wants t that is, add to the soil a mixture of four or five substances, that the wants to feed on, and if the soil does not become fertile, it will be fro lack of some other condition of growth than food. If from any cau farmer fail, either through want knowledge or inability to add these su

ces to his soil, and sees his crop diminish gradually from year to year until he gets only twelve or fifteen bushels, when he should have twenty-five or thirty to the acre, then he may conclude he is starving his wheat plants as truly as he would his cattle if he should give them only half enough to eat.

What has been said of the wheat plant may serve to point out the course to be pursued with any other plant. We must know its composition, and then furnish the soil with what will nourish it. This is simply manuring; and hence we see that manuring is only the art of feeding plants. To do this intelligently and well we must know what they feed on, and in what form their food is best assimilated by them; and the relation of chemistry to agriculture in this respect is to teach us the proper kind of food to give them.

Another question yet remains, viz: in what form are those substances taken up by the plants, as elements, or as compounds? Most of the elements occur in nature only in the form of compounds, and of those found in plants, not more than half a dozen are often found free. The inference therefore is, that plants take up the elements mostly as compounds. This is in accordance with a general law, that the higher the organism, the more complicated food it requires. The food of animals is more complicated than that of plants, and that of plants is, for the most part, not elementary. All the metals found in plants enter as salts. Potassium, for instance, as sulphate, carbonate, silicate, phosphate, or chloride of potassium; and so of the other metals —at least, those salts of them that are soluble in water. Carbon enters, as carbonic acid, mostly through the leaves, but also more or less through the roots. Hydrogen passes into the plant mostly with oxygen, as water, but also to a certain extent, probably, as ammonia and nitric acid. Phosphorus, with oxygen, as phosphoric acid; silicon, with oxygen, as silicic acid, and sulphur in like manner as sulphuric acid, pass into plants in the form of soluble salts. Chlorine enters the plant mostly in combination with sodium, as common salt. Much diversity of opinion exists with respect to the assimilation of nitrogen. Some believe that it is absorbed as a gas directly from the atmosphere, and assimilated as such; others, that it enters the plant as ammonia or nitric acid, and think they have, in the action of ammonical manures, a strong argument in support of that view; others think nitrogen enters the leaves, and there coming into contact with ozone, is converted into nitric acid, or some oxide of nitrogen, and in this form is assimilated. It is not the place, nor have we the time here to bring forward the arguments and the experimental results which are adduced by the supporters of these different views; suffice it to say that the question lies wholly in the field of chemistry, and that if it shall ever be decided, it will doubtless be decided on strictly chemical grounds. Such, then, are the compounds that become the food of plants.

Another question of interest, in this connection, is the state in which these compounds exist in the soil, when taken up by plants. And here again a diversity of opinion obtains. It was formerly supposed, and is so now by many, that these salts, which constitute, in part, the food of plants, are in solution in the soil, and, circulating there, come into contact with the roots, and are

absorbed by them. But the opinion now entertained by some is, that these salts are not exactly in solution, but adhere, with a certain force, to other constituents of the soil, like humus, clay, lime, etc., and are thus retained, ready to be given up to the roots as soon as they shall come into contact with them. This force seems to be a feeble manifestation of chemical affinity, very like that by which coloring matters adhere to animal charcoal or to the fibres of cloth. There is doubtless truth in both these opinions; and a careful investigation of the subject will probably teach us that the food of the plant varies, not only in the quality and quantity of its constituents, but also in the condition in which it exists in the soil.

It may not be improper, in this connection, to say a word on conflicting views entertained by scientific men. In the judgment of some, such views are sufficient to throw doubt on all conclusions of science. It must be borne in mind that a new science, or a new application of an old one, is always accompanied with more or less mistakes, even by those best versed in it. The enthusiastic pioneer in a new field of knowledge will be exceedingly fortunate if he do not misinterpret some facts, and frame some theories, which will prove, in the end, more or less visionary. No mind, however keen its penetration, can comprehend at once all the bearings of a science in a new field of application. Hence we must expect some mistakes. And then, too, unless the scientific man is extremely cautious in his use of language, he will sometimes make loose statements, which, although intended to express facts in his mind, do really express something else and mislead others.

But this is not the only difficulty. If mistakes have been made by the investigators of the principles of agricultural chemistry, how many more have been made by those who sought to apply them. With scarcely the rudiments of chemistry, and animated by the prospect of increased harvests, they have hastened to put in practice the principles. The conditions of their experiments have been as varied as quality and texture of soil, temperature and moisture could make them. Precautions, on which depend so much the success of experiment, have been neglected, either because they were unknown or deemed unimportant. And thus, experiment after experiment, made in this loose, haphazard way, has failed, as might have been predicted it would fail, and the failure has been charged to science, when it was due to the well meaning but unskillful experimeter. There can be no doubt that a large proportion of conflicting views and statements, on questions of agricultural chemistry, are due to bad experimenting. This is well illustrated by the beginner in the laboratory. He often fails in the simplest chemical reaction, because he has neglected some precaution: that is, some necessary condition.

His first impulse is to declare the statement false; but when he has learned how to do it, the discrepancy between statement and fact disappears, and he is surprised that so slight a variation in the experiment should have caused his failure. Is it then surprising that the same kind of bad experimenting extended over the whole field of chemistry, applied to agriculture, should lead to conflicting views?

The best way to obviate this difficulty is to become thoroughly familiar, not only with the principles of chemistry, but also with its practice. To experiment successfully without knowledge and experience, is just as impossible as to be an able, successful practitioner in any of the so-called learned professions without years of patient study.

Thus far we have touched only on the outskirts of the chemistry of the plant. Its constitution, its food, and the condition in which its food is taken up, have been noticed. The next step would be to enter the laboratory of the plant, where this food is digested, and to study the reactions which take place under the action of chemical force, modified by heat, light, electricity and vitality—reactions by which the different organic compounds are elaborated This is the field of vegetable physiology. Its province is the functions of the organs of plants. But these functions consist in large measures of chemical reactions. Take the formation of starch in the leaf. The materials of which it is formed are as unlike starch as they can well be. The carbonic acid is absorbed directly from the atmosphere; the water and the alkaline salts pass through the roots up into the leaf, and there in that little workshop these substances, reacting on each other, produce starch, and this process continued, that is, this continuous reaction, constitutes a function of the leaf. Vary the conditions a little—that is, replace some of the reacting substances by others, or change their relative proportions, or vary the intensity of the modifying forces—and tartaric acid, perhaps, or some other organic product, might be produced. And so of all organic compounds. These infinitely minute changes of condition, either in the materials or the forces, on which may depend the nature of the product, can be learned only by the nicest observation and the most patient study. It is the want of a definite knowledge of these changes of condition that renders the reproduction of organic substances in the laboratory so difficult. But if, from the intricacy of the conditions which underlie the processes, we are as yet unable to imitate the processes successfully in the laboratory, they are none the less chemical processes, and show that the relation of chemistry to vegetable physiology is as intimate as its relation to agriculture. In fact, the formation of a plant, from incipient growth to maturity, is largely a continuous and complicated series of chemical reactions, and the plant itself, in so far as it is the result of such reactions, may be called a chemical product.

If then it be true that vegetable growth is largely a series of chemical reactions, resulting in the formation of the proximate constituents of the plant, it is clear that chemistry must sustain a most important relation to agriculture, and deserves the careful study of all who, in their husbandry, would derive from it the benefit which it is suited to impart. Because it has failed to fulfill the extravagant expectations, excited some years since by the writings of Liebig, we are not to infer that it is of no practical advantage to agriculture, and that the study and application of its principles in the growth of plants will be time and labor lost. Very many futile efforts have been made to reduce the gold from Colorado ores, but we are not to infer from this that chemistry is of no benefit to metallurgy. It is without doubt true that a subject of such complexity as the chemistry of plants has not been, and is not

yet, well understood. Whatever difficulty there is, lies not in the chemistry of agriculture, but in our ignorance of it. As soon as we have an accurate knowledge of the conditions and laws of growth, and in our efforts to aid nature, work with and not against her, then the discrepancies and apparent contradictions, always incident to a new science, or a new application of an old one, will disappear, and we shall have the greater cause to admire the wisdom and skill of Him who evolves, through this interaction of materials and forces, the many forms of plant life.

SECOND DAY—9 O'CLOCK.

Mr. M. L. DUNLAP moved that Dr. E. S. Hull, of Alton, be elected chairman of the Farmers' Institute, now in session.

The motion was carried.

Dr. J. M. GREGORY moved that O. L. Barler, of Upper Alton, act as Secretary of the Institute.

Carried.

At the suggestion of Dr. GREGORY, Mr. M. L. Dunlap moved that the morning hour of meeting be changed from 9 o'clock to 10 o'clock.

Carried.

Dr. GREGORY—I will take this opportunity to announce to the visitors present, that the college library will be open when the lectures are not going on, to which all are invited.

METEOROLOGY.

BY PROF. WM. M. BAKER, CHAMPAIGN.

The subject assigned me in the present course of lectures is not of my own selection; neither is it one to which I feel capable of doing justice, as indeed no man can, in the short space of one lecture. Meteorology is a subject so varied and extensive, that a person is puzzled rather as to what *not* to say, than as to what he shall present. It is very commonly thought, when the science of Meteorology is mentioned, that it relates only to the meteors that occasionally shoot athwart the sky, or to the so-called shooting stars, whose fiery flight we may see almost every night; and it is therefore supposed to have but little general interest. Or, if extended to include Climatology, it is supposed to have reference chiefly to the influence of the moon upon the weather, and to the prediction of storms, or of changes of temperature. Failing in these, it is thought to have no value.

But when it is seen of what this science really treats—the wide extent of investigations it covers—the varied phenomena sought to be explained by it—we shall feel, I think, that, though we are not yet able to foretell the changes of weather with certainty, and though the influence of the moon upon climates is still a matter of dispute, the science of Meteorology is neither a barren nor an unprofitable one.

In the words of a distinguished writer upon this science, "Meteorology treats of the constitution and weight of the air; of its temperature and moisture; of the movements of the atmosphere; of the precipitation of vapor in the form of dew, hoar-frost, fog, cloud, rain, snow and hail; of the laws of storms, including tornadoes and water-spouts, with various electrical phenomena, including atmospheric electricity, thunder-storms and the polar aurora; as also various optical phenomena, including the rainbow, twilight, mirage, coronæ and halos; to which are generally added ærolites and shooting stars."

The extensive field which it covers will thus be seen, as also the futility of attempting to treat thoroughly of even one of the subjects indicated, in the short space allotted me. I shall be pardoned, then, for any lack of continuity or logical sequence that may appear in what I have to offer.

It may be seen, also, from the complex nature of the science, the many and varied phenomena of which it takes account, why it cannot be brought down to strict mathematical certainty. As Humboldt, who devoted a long life to the investigation of this department of physics, says: "The processes of the absorption of light, the literation of heat, and the variations in the elastic and electric tension, and in the hygrometric condition of the vast ærial ocean, are all so intimately connected together that each individual meteorological process is modified by the action of all the others. The complicated nature of these disturbing causes increases the difficulty of giving a full explanation of these involved meteorological phenomena, and likewise limits, or wholly precludes, the possibility of that predetermination of atmospheric changes which would be so important for horticulture, agriculture and navigation, no less than for the comfort and enjoyment of life. Those who place the value of Meteorology in the problematic species of prediction, rather than in the knowledge of the phenomena themselves, are firmly convinced that this branch of science, on account of which so many expeditions to distant mountainous regions have been undertaken, has not made any very considerable progress for centuries past. The confidence which they refuse to the physicist they yield to the changes of the moon, and to certain days marked in the calendar by the superstition of a by-gone age."

If Meteorology could only foretell storms, changes of the weather, etc., of how great value would it be, not only to the farmer but to all classes. When the thermometer and the barometer were first applied to meteorological study it was fondly hoped that this problem would be solved, but years have passed and the end is not reached. Yet great results have been attained—general laws have been discovered, and steady progress has been made, if not as grea as was fondly hoped, yet far from contemptible.

There have not been wanting those who have imagined themselves the discoverers of so desirable a thing as the law which would enable them to fore-

tell with certainty weather changes; but they have all, when tried in the balance of actual experiment, proved wanting. It may be stated as certain, that, with our present knowledge of the science, no man can foretell with any certainty, so as to be of practical use, the changes of the weather or the approach of storms. A few years since one man believed he had discovered a principle or theory which would enable him to do this; but, when asked by the Regent of the Smithsonian Institute, as a condition to their publishing his book, that he would foretell the weather of one month in each season of one year, he declined the attempt.

Turning now to the other subject of popular expectation, viz: the influence of the moon upon the weather, what shall be said? Throughout the whole community, nearly every person has some sort of a belief in the influence of the moon over planting and all of the operations of the farm. It seems impossible that so wide-spread a belief should not have a good foundation, and yet extended and careful investigations leave us still in doubt upon this point. Olbers compared carefully for fifty years the moon's positions with the weather, and stated that he could see no effect that it had.

It may be of value to state here that the Herschels deny any belief in the existence of any system of lunar influences, and especially repudiate the weather table often attributed to them.

Samuel Horsley, L.L.D., in 1775—then Secretary of the Royal Society—states as the result of his investigations, after quoting largely from Greek and Latin writers: "On the whole I do not deny that the observant husbandman will find a variety of useful prognostics in the appearance of the moon and the heavenly bodies in general, but they will be prognostics of no other kind, and for no other reason, than the sputtering of the oil in the industrious maiden's lamp, or the excrescences which gather round the wick, *i. e.*, they are in our own atmosphere."

At the meeting of the American Association for the advancement of Science, last August in Chicago, Prof. Loomis, of Yale, a well known meteorologist, read a paper upon the influence of the moon, of which the following is a synopsis: "Several meteorologists have attempted, by a comparison of a long series of observations, to determine whether the moon exerts any influence upon the weather. From a comparison of twenty-eight years of observation in Germany, Schubler, in 1830, deduced a sensible influence of the moon; the number of rainy days at the time of the second octant being twenty-five per cent. greater than at the time of the fourth octant. From a comparison of observations made at Paris, Orange and Carlsruhe, Gasparin arrived at results not differing greatly from those of Schubler. By a comparison of sixteen years of observation at Greenwich, nine years at Oxford, and sixteen years at Berlin, Mr. Harrison, of England, has obtained results which are remarkably consistent with each other, and which indicate that the moon exerts an appreciable influence upon terrestrial temperature—the maximum occurring six or nine days after the new moon, and the minimum about four days after the full. The difference between the maximum near the first quarter and the minimum near the last quarter is two and a half degrees, Fahrenheit. These results, which are so different from what might have been anti-

cipated, Mr. Harrison explains by supposing that the moon really attains its greatest heat about the last quarter; but that the heat which the moon radiates to the earth is entirely dark heat and therefore absorbed by our atmosphere. This heat raises the temperature of the air above the clouds, causing increased evaporation from their surface, by which they are dispersed, and thus there is an increased radiation of terrestrial heat to the sky, and consequently a diminution in the temperature of the air near the ground. He supposes that opposite results must occur at the period of minimum heat in the moon. Upon extending the comparison to forty-three years of observations at Greenwich, Mr. Harrison finds still a fluctuation of temperature, but the range is reduced to one degree and one minute, instead of two degrees and five minutes. Mr. Ballat, on tabulating a series of seventy years' mean daily temperature, according to the moon's age, found that the highest temperature occurred during the seven days after full moon, being almost precisely apposite to the results of Mr. Harrison. Schiaparélli has made a careful analysis of thirty-eight years of observations, made at Vigirano, near Milan, in Northern Italy, and has attained results which are also remarkably consistent with each other. They show that about the time of the last quarter of the moon there is a maximum in the number of rainy days, as also in the frequency of storms and in the degree of cloudiness." The Prof. then exhibited a table of results which he had deduced from seven years' observations, and drew the conclusion that the moon did affect the weather, and maintained, in direct opposition to Prof. Herschel, that the moon, just before its full, influenced the weather toward cloudiness rather than clearness, and followed the same law as the sun.

When, after so long and careful investigation, philosophers are still in doubt, it would seem that the moon's influence may be disregarded in practical life. The air we breathe—that which, in its freedom, sweeps past us and bloweth where it listeth—who has ever fathomed its mysteries? Perhaps that which we are this morning inhaling was breathed by the lips of beauty thousands of years ago. Since creation it has swept around the world—now over the burning sands, and then over arctic snows—over orange groves, and across the stormy ocean, it has traveled, and how little we heed it. Thousands of years ago, vegetation, by the help of sunlight, secreted in earth's treasure house some of its ingredients, and now, as we burn the coal, we liberate them, again to play their parts.

The causes of the various winds are not completely understood, but extended investigations show the following results as to the direction of the prevailing winds over the globe. Throughout the equatorial region of the globe the winds show a remarkable uniformity. On the north of the equator they blow almost uniformly from the north-east quarter, while south of the equator their direction is from the south-east. These form the trade winds, so-called. In the Atlantic, the north-east trades extend, on an average, from near latitude 7 deg. north, to latitude 29 deg. north. The south-east trades extend to 20 deg. south. Between these there is a belt of variable winds, or of calms, extending from 150 to 500 miles in breadth, according to the season. The center of this belt of calms is north of the equator. Beyond the influ-

ence of the trade winds we find also a belt of calms, or variable winds, the northern one being called the calms of Cancer, the southern the calms of Capricorn. These also vibrate up and down according to the season; the extreme vibration of the calms of Cancer being from 17 deg. north to 38 deg. north, the center being somewhere near 30 deg. north. Beyond these belts of calms it is found that the prevailing surface winds are in a contrary direction from the trade winds, *i. e.*, from 29 or 30 deg. north, to near 60 deg. north. The prevailing winds are from a south-westerly direction—the westerly winds in one latitude being to the easterly as 5 is to 2. Beyond 60 deg. north, again, there is a belt of comparative calms, north of which the prevalent winds are again from a northerly and easterly direction. As the surface currents are so prevalently in these directions, it follows of course that there must be upper currents in the opposite directions, to restore the disturbed equilibrium of the atmosphere.

But, it may be said, this is only theoretical, how can it be proved that such upper winds actually exist? Strict proof in such a case is, of course, difficult to give, and yet we are able to give what amounts very nearly to a demonstration. Ashes from volcanoes are occasionally thrown higher than the prevailing surface winds, and falling into the upper current, are by it carried in the opposite direction, and by their fall tell us of this current. Thus, in 1812, the volcano of St. Vincent threw out an abundance of ashes. Much ashes fell at Barbadoes, ninety miles east, though the wind was directly opposite. In 1835, from Cosquina, in latitude 13 deg. north, on the shores of the Pacific, ashes fell upon Jamaica, 700 miles north-east from the volcano, while ashes were carried westward more than 1200 miles. In southern Europe, at Genoa and Lyons especially, a fine dust occasionally falls, which has been generally supposed to be from Sahara, and taken up by the siroccos. But Ehrenberg, upon subjecting it to a microscopical examination, found that it contained organisms peculiar to the valley of the Orinoco, and the conclusion is inevitable that it comes from South America, and not Africa. On the summit of Maunakea, at the Sandwich Islands, the wind is generally found to be strong from the south-west, while the trade wind at its base is south-east. The Peak of Teneriffe is not of elevation sufficient to reach the limit of the lower half of the atmosphere, and yet the wind on its summit is often contrary to the wind at its base, while the clouds over the peak constantly move in a direction opposite to the trades.

In the middle latitudes the upper current moves from a northerly direction, as is shown by the following facts. In 1783 Mount Hecla emitted smoke and ashes for more than two months. The smoke rose to a great height in the atmosphere, and spread over nearly the whole of Europe, forming what was called a dry fog. From the north-west it extended south and east to Italy, and even to Syria, thus showing that, during those two months at least, there must have been an upper current contrary to the prevailing surface one. During another eruption of this volcano, in 1845, great quantities of ashes fell as far south as the Orkneys. Æronauts who have ascended to the height of 10,000 feet in the middle latitudes, usually find the wind blowing from the west, and if they ascend higher, from a point north of west. If, during a

specially dry time, clouds are observed at a great elevation, they are usually found to move from a point north of west.

The system of atmospheric circulation may be stated thus: Within the tropics the surface current moves toward the equator, and the upper current from the equator. In the middle latitudes the surface current is moving from the equator, and the upper current toward the equator. In the polar regions the surface current is from the poles, and the upper one toward the poles. These currents are, of course, modified by the revolution of the earth, which makes the trades north-easterly and south-easterly, and the winds in our latitude south-westerly.

In regard to storms also, some laws have been learned which may now be regarded as settled.

1. All great storms are generally rotary.

2. North-east storms begin in the west and do not come from the east. The storm, on the contrary, advances east, and is generally followed by a west wind.

Thus the telegraph enables the cities east of us to know, hours before its arrival, the coming of a north-east storm.

Cyclones, or whirlwinds, are revolving storms of a more intense character. It is found that in the northern hemisphere they revolve contrary to the direction of the revolution of the hands of a watch, while in the southern hemisphere they revolve with the hands of a watch. Therefore the navigator is enabled by heeding the direction of the wind to sail out of its power.

Storms generally move eastward at the rate of from 300 to 800 miles in 24 hours. The north wind felt in our own latitude is not always, nor perhaps usually, from the north. Indeed the lake districts are often warmer than the countries south of them, or at least have a milder average temperature. Thus in Michigan they raise the peach without difficulty, which is here so uncertain a crop. Generally the west is to be scanned to judge about the weather to be immediately expected, and the currents as indicated by the clouds give the best proof.

The question is often asked, where does our rain come from? It cannot come from the land, as only three-tenths of the surface of the earth is land, and the rivers are continually acting as drains to carry off the surplus. Obviously, then, the most of the water annually precipitated must be raised by evaporation from the oceans, and as nearly all the large rivers of the earth are in the northern hemisphere, presumably much of it from the southern oceans, being brought north by the upper currents, and others precipitated. The annual fall of rain is estimated at five feet. If this were taken from the torrid zone entirely, Lieut. Maury estimates that it would be equal to a river 3,000 miles wide, 16 feet deep, and 24,000 miles long. But the mean annual fall of rain is not alike at all points. Some places, as a point on the Himmalayas, have a fall of 50 feet annually, while others, as the deserts of Africa and Arabia, of Gobi, the table land of Mexico, and about 5,500,000 square miles of the western declivity of the Andes in Peru, are nearly or entirely rainless. We have a mean annual fall of a little more than 30 inches. A question of interest to us is, where do the waters of the Mississippi basin

come from? Some assert that they are brought from the Gulf of Mexico, while others contend that they come from the Pacific, passing in the upper current over the comparatively low range of the southern spurs of the Rocky Mountains, and descending to the earth at the calms of Cancer, thence to be distributed by the prevailing south-westerly winds along the extent of their course. It is a well known fact that mountain ranges have a tendency to cause condensation and deposition of moisture. Thus the prevailing trade winds from the south Atlantic, laden with moisture, sweep over the broad level of the plain of the Amazon, and by the Andes, being forced to deposit their superfluous moisture, are dry winds in Peru and Bolivia, while east of the mountains is a region of almost constant rain. At one time, at the White Mountains, I saw a storm detained a whole day by the mountains, it raining on the eastern side nearly 24 hours sooner than on the western.

Another question, towards the solution of which the science of Meteorology has made much progress, is as regards the causes of the difference of climates of places under the same latitude. We find England and Labrador at about equal distances from the equator, one with a mild and equable climate, the home of civilization, while the other is scarcely inhabitable. In the Orkneys, ponds are not frozen in winter, while in corresponding latitudes in British America, they are scarcely thawed in summer. And so throughout, the western coast of Europe has a much milder climate than the corresponding coast of our continent. So on our western coast, Sonora and California have climates very similar to Persia and to Palestine, while Vancouver and Sitka bear a resemblance in this respect to Great Britain and Norway. These differences are caused by the warm currents of the ocean impinging in either case upon the eastern shores, and thus elevating the temperature of the air and modifying the climate. It is found that the isothermal lines, or lines of equal temperature, ascend higher upon both western coasts. In the Mississippi basin we have, from our position, a high summer and a low winter temperature.

In regard to changes of the climates of different countries, a distinguished meteorologist says: "The climate of a country remains constantly the same from century to century. Observations for more than a century show no change in the mean temperature of the year, or of separate months; no change in the range of the thermometer; none in the time of the last frost of spring or the first frost of autumn; none in the annual amount of rain or snow. It is not certain that the climate of any country in these respects has changed for 2,000 years. By destruction of forests, streams dry up and droughts are produced, which are relieved by replanting, but this seems not to affect the mean amount of rain, or mean temperature." Thus we can predict the probable character of any month in any year. So, if several months in succession have been unusually warm, or unusually cold, we may expect that the following months will be of an opposite description. Prof. Loomis gives some prognostics, drawn from the face of the sky, clouds, etc., which may be of some practical value to some one, and I will therefore give them.

1. When the upper clouds move in a direction different from that of the lower clouds, or that of the wind then blowing, they foretell a change of wind.

2. When the outlines of cumulus clouds are sharp, it indicates a dry atmosphere, and therefore presages fine weather. Small, inky-looking clouds foretell rain. A light scud, driving across hazy clouds, indicates wind and rain.

3. Remarkable clearness of the atmosphere near the horizon, and an unusual twinkling of the stars, indicate much moisture in the upper regions of the atmosphere, and are therefore indications of approaching rain.

4. Halos, etc., indicate rain or snow.

5. Dew and fog indicate fine weather.

Having thus, in so disconnected and hasty a manner, run over some of the points of this interesting science, I cannot close without expressing my belief that, from the multitude of observers now at work, and of observations now being made, greater results than have yet been obtained are at hand. To a true theory of the science, every accurate observation, however humble, prepares the way. Nowhere is there more need of such observations than over the broad prairies of the northwest. Why may not every one now before me contribute his mite to this, and thus, in enriching others, enrich himself a thousand fold?

DISCUSSION.

Mr. M. L. DUNLAP said that he had given this subject some attention, with a view of making some practical use of it in accounting for the many eccentricities of our climate. He believed that this science could be made available in a great many instances, but was well aware that it needs, to understand it, an immense amount of study and investigation. What the lecturer had said about the direction of the prevailing winds, and the philosophy of storms, accorded with his observation and experience. The direction of these storms often appeared to be from the north-east, but they came, in fact, from the west. He noted, as a singular fact, that a storm, starting at a given point, and moving forward with accumulating force, would pass over certain portions of the country harmlessly, while other portions were swept with terrible force. Our periodical eastern winds are indications of storms that may or may not bring rain. If the atmosphere is charged with moisture, we are liable to have a rain storm. When we have these eastern winds, you may note the fact that we are very apt, soon after, to read of a storm on the Atlantic coast.

In speaking of the trade winds, he showed that they were the cause of the cold south-west winds which sweep up through the Mississippi valley, to the injury of our fruit. Our productions are virtually grown in one climate and wintered in another—they are grown in the tropics, and wintered in the cold winds of the north.

This will account for so great loss of plants and trees. There no way to remedy the evil but to plant timber belts; and it is f this reason that I have always urged upon farmers the importan of planting trees for the purpose of serving as shelter belts. The is another advantage in this. If we plant more timber, we wi of course, make the climate more moist, and clouds passing ov timber lands give down the rain just as the mountain rang wring out the last drop of water from the passing clouds. I thi these observations will be found to be correct in the main.

Prof. BAKER, in answer to a question, said that the average n fall over the whole earth was five feet per annum. We have h about 27 inches. The water is taken up by evaporation and fi in rain, in quantities as stated in the lecture. In regard to t great amount of water taken up by evaporation, we stated tha would form a mighty river, 16 feet deep and 24,000 miles lon So that the great Mississippi, as it flows to the gulf, has its co ter Mississippi invisible in the air, bringing its waters back.

Mr. FREEMAN—The Prof. spoke of the necessity of timber b as a protection against the influence of malarious diseases. N this reminds me of a remark made to me by a man who went Natchez 60 years ago, where they had the yellow fever. Natc is situated on a bluff, opposite a marsh, to which they attribu these malarious influences from which they suffered. He sp 30 years there, and finally went to the north. He said that better class of people began to move out into the woods, b from the river, in order to escape this influence, but, until country was opened up back from the river, they suffered from diseases of the country. But after the country was opened around them they seemed to enjoy immunity from these disea

Mr. ROBINSON—I would ask the Prof. what difference he fi in the thermometer when exposed to the wind—suppose the w blowing from the east, you carry the thermometer from the w side to the east side of a belt of evergreens, what change is effe in the thermometer?

Prof. BAKER—The thermometer does not tell us how cold are, but is simply an indication of the degree of cold.

Mr. ROBINSON—That is only a partial answer. I want to k what benefit the belt of evergreens is going to be. Now my perience is, that the thermometer will not show any differe The degree of cold indicated is the same on either side wh

rere wind blows, although there is a difference, perhaps, of ten grees.

Prof. BAKER—It is true that the evaporation caused by the pas-ge of the wind over the plants would affect them, as animals are fected by it, and they would really suffer from the cold winds as imals suffer from them, though the thermometer indicated the me degree of cold in and out of the wind.

Dr. GREGORY—Dr. Draper asserts that there is actual heat gene-ted in the tree. Bore a hole into a tree, and let the tree cool om the warmth from boring, and insert a thermometer, and you ll find the tree of uniform temperature, warmer than the atmos-ere. Now if this be so, the tree has the power to give off heat, d the wind blowing upon the tree would liberate more heat and ke away moisture. These observations of Dr. Draper seem to e to be exceedingly interesting, and worthy of consideration.

Mr. PERIAM—My experience is, that a thermometer placed upon e east side of a belt of evergreens in the afternoon, at a distance 20 feet, when the wind is blowing from the west, will show a nge of ten degrees. The thermometer will sink ten degrees wer on the west side than on the east side.

Mr. DUNLAP—It is easy to show the great advantage of ever-een belts in moderating the climate and warming the atmos-ere. They take in heat in the daytime and give it off at night. at is the reason for the practice of some in planting every fourth e in their orchard an evergreen. It is simply a matter of expe-nce and observation that evergreens temper the climate. By nting these belts we will save our fruits, and may plant many rieties in the north which would fail without this protection. e practicability and advantages of this practice we expect to monstrate in this institution, and to illustrate upon these grounds , one of the great and leading facts essential to success in fruit ture, especially in the northern part of the State. There is no estion but there is a vast amount of truth in the assertion of Dr. egory, that trees give off heat. Let us recognize this important th, and not cease our tree planting until we are fully protected these timber belts.

Mr. ROBINSON—It will take twenty-four hours for frost to pene-te to the heart of a tree two feet in diameter. It may be frozen ernally, and not frozen at the heart.

Prof. STEWART—I have no doubt with reference to the temp
ture of trees being higher than the air about them. The tr
a living being as much as an animal. As the temperature of
mals is higher than that of the surrounding atmosphere, s
may expect to find in plants a temperature higher than that o
atmosphere. There is this consideration, also. What is it th
going on when plants are growing? Plants grow by a seri
chemical combinations, and where these changes are going
there is heat evolved. You cannot have chemical action wit
heat being evolved. Chemical action is that which produces
in animal life, and the same is true in the life and growth of pl
We should naturally infer this from the nature of the process
is going on. I also desire to say this respecting the influen
the moon upon the weather, which matter has been alluded
the lecture. I place no reliance upon the supposition that
moon has any influence upon the weather. I would sug
whether these contradictory results, arrived at by so many ca
observers, are not attributable to local causes. Every sectio
the country has its peculiar climate, and may not these local ca
produce these different results, instead of having to go to
moon to account for the weather? Had we not better stay
the earth, instead of going off to the moon, and find cause
home, instead of abroad, for these changes of weather? I th
if we understood the matter fully, we should find that the m
had very little to do with the weather.

Dr. GREGORY suggested, in view of the fact which seemed t
established that trees generate heat, whether they have no
this, the power to resist frost. The human system, if frozen,
He was inclined to the opinion that if a tree was frozen to
heart it would die also. But all this looked so much like
theory, that it was hardly safe to advance such an idea.

Mr. ROBINSON questioned the position of Prof. Stewart that
always accompanies chemical action. He was under the im
sion that there were cases of chemical combinations where
was not evolved. Is it not so?

Prof. STEWART—I know of no instances of this kind. If
take the oil of vitriol and mix it with ice, there will be a chem
combination, and there will be produced a very low temperat
Still there is at the same time heat produced. I have not
slightest doubt of this. I know of no instance where ther

mical combination without producing heat. With reference to chemical action in the growth of trees, this of course explains increased temperature, for chemical action produces increased perature. In the summer, when the process of life is going when the different parts of the tree are forming these different mical combinations, there will be heat.

Ir. DUNLAP—There is no question the tree has a twofold pow- one of growth, and one of hibernation. In a state of growth re is going on chemical action, and of course there is heat pro- ed. In a state of hibernation it has power to resist cold. The may freeze to the heart and not be seriously injured. There nother point to which I wish to call attention, and that is with rence to the influence of the moon on vegetation. In my prac- I pay no attention to the moon. But there is this fact—and ish the students here would give it their attention. If the on falls about the tenth of September we are more liable to e early frosts than when it falls at any other time. If the on falls about the 20th of September we are less liable to early ts than otherwise. It does not always so happen, but this is erally true. If this fact was regarded in the time of planting n, and the estimate made of the time to mature the corn crop, ch is 125 days, it would perhaps be well. This is the only tical fact about the moon's influence, and there is a good deal t. If I am correct, we can save our corn crop from the frosts arly planting. At any rate, there is need of further investi- on in this direction.

THE SOILS OF ILLINOIS.

BY H. C. FREEMAN, OF THE STATE GEOLOGICAL SURVEY.

he lecturer gave as the definition of the word soil, that part of surface of the earth in which plants grow. It is a compound tance, formed from the decomposition and disintegration of ks, and is peculiarly fitted to furnish food for plants. He gave account of the origin of soils, which led to a minute descrip- of that portion of the earth known as alluvium, terrace, loess, and tertiary. The disintegration of rocks which form our is caused by mechanical and chemical agencies. But there other forces at work—the deposit and admixture of this debris ne to river and ocean currents, and to the ice in the glacial od.

The lecturer stated that the soils of Illinois were of themselves the study of a lifetime, and made mention of their varied form in the different portions of the State. At LaSalle, an upheaval has brought to the surface the St. Peter's sandstone, which is much used in making glass. It has the appearance of white sugar. This sand, appearing on the Illinois river, near immense beds of coal, suggested that the time would come when an immense business would be built up in glass manufacture.

We have at Peoria a different formation of soil, a sort of modified drift, known as the terrace formation, the result of the action of water currents. The yellow clay of other localities, and the soil peculiar to the prairies, were all mentioned, and the statement made that each variety of soils required different treatment, depending upon moisture, climate and drainage. The soil near Cobden seemed, to a great depth, to possess elements of plant growth. In one instance, in digging a cistern, a root of a peach tree was found, reaching down to the rock-bed, a distance of nineteen feet. The inference is, that the soil in this great fruit region has good drainage.

The lecture was illustrated by a diagram of the elevations throughout the entire length of the State, from Cairo to Dunleith.

The lecture was instructive to those who heard it, but it partook so much of the style of a recitation in a class-room, the life of which was all on the blackboard, that it was impossible for your reporter to take it verbatim and do justice to the lecturer, and he has not attempted it.

SECOND DAY—EVENING.

DR. WARDER'S LECTURE ON THE MANAGEMENT OF SOILS.

Mr. President: It would be well could we imitate an illustrious example set before us. A gentleman was asked to make some remarks upon a public occasion, and his reply struck me as one having force and sense in it. It was this: "When I have anything to say, I am always willing and happy to say it, and when I have nothing to say, I do not say it." Though I have been much interested in the subject assigned me, I yet feel that there might have been a much better selection made than you have made for the discussion of this topic. I would suggest a different wording of my subject. I would pre-

to limit the subject and talk to *earth-working*. The management of soi too large a question. I think it is better that I should confine myself to ply earth-working. This will be found to include all those operations ich have for their object the comminuting of the soil, and that treatment the soil and plants called cultivation, whether done by one implement or ther. The various kinds of utensils used in working the soil will be a ding topic of the lecture. The instruments in general use are the plow, harrow, the roller and the cultivator, adapted to the draft of horses or tle.

There are also other utensils used, with hand-power, such as the spade and ferent varieties of hoes, the "split hoe," as it is called by Virgil. Mr. Hex- er calls it the "pronged hoe." We find this one of the best of hoes. We re also the scraping hoe, used for the purpose of destroying weeds upon hard ground, and the grubbing hoe. These, however, are not so service- e as the pronged hoe in stirring the soil. There is another class of tools— rake and the brush.

Earth-working, therefore, covers all cultivation of the soil, and all cultiva- n of the soil necessitates the use of implements of some kind. The plow ads at the head of these implements. It is wonderfully interesting to ce the history of this implement, and see the great progress that has been de since the earliest times. The figure upon the left (here the lecturer re- red to diagrams drawn on canvas and hung up before the audience) is a r representation of the implement used in early times for plowing. Before , even, there was in use a ruder instrument still, a sharpened stick. But diagram is said to be the original representation of that instrument—the w. It is simply a stick, with a branch or fork, one of which branches is rpened, and a limb is left to be used as a handle.

he plows in our own country in early times were almost as rude. Some s can perhaps even remember the wooden mouldboard, chopped out with axe. A little later we had a strip of iron attached, which was a step in provement. It was the old-fashioned *bull-plow*, a sort of shovel-plow, which med to do pretty good work in its time. You need not go beyond the its of your own State to find this style of plow. As we progressed in owledge, the plow improved in style of manufacture, until, not to go into tails, we now have reached the perfect plow, so nicely made and fitly fash- ed, that it passes through the soil almost without resistance. Among the difications of the plow are the trench-plow, the double Michigan-plow, the ng-plow, the object of which is to economize human labor. Then there is a le known as Dr. Grant's trench-plow. We have, also, steam-plows, with object of saving horse labor, as the gang-plow economizes human labor. ere is still another modification of the plow. I refer to the rotary spader, ich proposes to thoroughly stir and comminute the soil.

n considering the history of the plow, he showed that the progress from rudest implement to the modern plow was very slow. He showed a dia- m of a rude instrument used in Palestine for loosening up the ground, ething as a hog or mole would do. It is called the Caschrone, and is used this day in some of the outer Hebrides in Europe. The wooden portion is

one single piece, and was doubtless selected on account of the natural crook in the timber. When the plowman wished to run his plow deeper he would raise up the handles on his shoulder; if his plow ran too deep, he pressed downward on the handles. This plow had an iron point. Mention was made of the Rotherham plow (supposed corruption of Rotterdam) at the commencement of the last century. It was a wooden plow, shod with iron. It entered the land on the principle of burrowing, rather than that of clean chisel cut.

Jethro Tull gave preference to the old Berkeshire plow, which was inferior to the last named in ease of management and ability to do work. He believed in "elbow grease." His plow was one with four coulters. He thought that this arrangement more thoroughly divided the land. But this implement was never generally used, and no improvement worthy of notice, from that time until the commencement of the present century, was made, when one of our own countrymen, Thomas Jefferson, had his attention directed to the improvement of the plow. He saw that the plow should be an instrument with power to act upon the soil vertically and horizontally. This would require a nicely fashioned curve. He had his plow put in operation on his own estate, where it worked satisfactorily.

The lecturer here stated that he would rather read from authorities on this subject than to present his own ideas. He accordingly read frequent and copious extracts from a work which he characterized as an exceedingly valuable one. It was the report of the plow trial at Utica, New York, in September, 1867, held under the auspices of the State Agricultural Society, and prepared by Hon. John Stanton Gould. The extract read had reference to the improvements made in the plow.

Two or three names mentioned in connection with the improvement of the plow, the speaker considered worthy of note. Mr. Newbold was the first American, after President Jefferson, to improve the plows in common use. He spent $30,000 in his efforts in this direction, and made the first American cast iron plow. He used the plow himself, but could not pursuade his neighbors to do so. They said it poisoned the land and promoted the growth of weeds! The patent for this plow was granted on the 26th June, 1797. From this time on, a great many patents were taken out for improvements, when, in September, 1819, Jethro Wood, of Scipio, New York, took out a patent for an improved plow, and from this pattern he never varied. Very many plows were made from patterns furnished by him, and even at the present day, in different parts of the country, there are plows made that differ very little from principles laid down by Jethro Wood. He was the first man who made a plow in three parts—the mouldboard, share, and landside. But the mouldboard was too full in the middle; it was not sufficiently concave. Measuring from the point of the mouldboard, the landside measured two feet and three inches long.

One of the next great improvements made was put forth by Withero and Pierce. The principal feature in this improvement was in the curve of the mouldboard. The object sought was to have a cycloidal curve. Samuel A.

Knox, of Worcester, Massachusetts, made an improvement worthy of note. Also, a Mr. Burrow, of New York, was another who was quite successful.

The great desideratum in a plow is not simply to turn over the ground, but it is to break up the soil as finely as possible in turning it over. We hear a great deal about spade husbandry, and it has this merit, that it does comminute the soil in a most thorough manner. We have many plows that do not break up the soil. These are not satisfactory. But again, we have plows—the double Michigan, for example—that do break up the soil in good style. I say double Michigan plow, because this is a plow having the right kind of a mouldboard for this work.

The lecturer next treated of subsoil plows, and gave a definition of subsoil. It is the *under* soil, the soil below the top soil. Suppose we have a plow that lifts a furrow twelve inches deep; now, if we wish to go still deeper, we use a subsoil plow, or trench plow. Dr. Grant has constructed a plow which is a true trench plow—a plow that throws up the under soil, and mixes it with the top soil. Dr. Grant claims that this is good practice. It may do for his soil, but there are soils where this will not do. It would be temporarily ruinous to bury up the top soil with cold stiff clay subsoil.

In deep plowing it is not desirable to plow too deep at once, but gradually to deepen the furrow at each subsequent plowing. In this way no bad effects will be experienced, but, on the other hand, a decided improvement in the land. I hope there are those here who can give us their experience upon this subject.

The subsoil plow proper is an implement that does not bring the under soil to the top, but simply breaks it up, and leaves it in its natural position. When this idea of a subsoil plow first entered the head of the inventor he thought it must be a turning plow, that it must have a mouldboard, and he proceeded to construct the plow upon this principle. It was thought that the plow was good for nothing unless it raised the earth into the air! The great objection to a plow of this kind was that it required too much power to move it—the draft was too heavy.

It was not until Prof. Mapes invented his plow, that progress in this direction was made. He invented a plow without a mouldboard—a plow which did not throw out the subsoil, but only loosened it, and left it in its proper position. The elevation of the earth was not more than two inches, so that the draft was comparatively light. The ground was loosened up so as to admit the air into the soil. This was all that was needed, and this was easily effected by this implement. I can entertain you better by turning again to our authority. [Here the lecturer read a long extract from the Report, elucidating still further the history of the plow.]

The great object in plowing is not only to reverse the soil, and to put the grass and weeds out of sight. It is to do this, and also for the sake of commingling the different portions of the soil together, and breaking it up by turning it over. The spade is a superior instrument for this work of comminuting the soil, and for this reason has advantages over the plow. In the process of digging the mingling of the soil is more thoroughly effected.

We will turn once more to our authority. The extract had reference to the objects sought in plowing. The object was not only to kill weeds, but to secure that condition of the soil enabling the roots of plants to readily permeate it in their search for food. He again commended the Report, from which he had made such copious extracts, as an exceedingly interesting and valuable document. It was prepared by one of the best minds of the country.

But after all the improvements made in the plow, the result obtained is not just what we want. The plow that will do good work in gravelly soil will not do on our rich prairies. After all the learning and skill and labor bestowed upon this instrument, the plow is a very unphilosophical tool. After having been brought nearly to perfection, and even giving satisfaction, it is still an unphilosophical instrument. And that is not the worst of it; while it remains what it is, and retains its present form, this must ever be the case. Since action and reaction are equal, there is and must be a great loss of power in this implement. We see this in the working of the plow. We see it in the condition of the soil beneath the plow—that condition which farmers call "furrow-trod," the ground becomes harder. For every pound weight lifted there is a pound exerted downward. The effect is known to all. Again, for every pound weight lifted, there is pressure of a pound upon the landside. The effect is apparent, and you will see the land *shine* after the plow has passed by. We live in hope of further improvement in that very useful tool, the plow.

DISCUSSION.

Mr. DUNLAP—We have a plow, invented in this county, that is not liable to the objection of which Dr. Warder has spoken. But if there is any instrument, other than the plow, that is to come into use, and that will do the best service, I believe it will be Comstock's Rotary Spader. I have had hopes of this instrument, and some day may have them in use. It has already been put in use in this vicinity, on seven or eight hundred acres, and in certain conditions of the soil works well. When we underdrain our soils I think we shall find the rotary spader a very desirable instrument for stirring and comminuting the soil. Until that day does come, until we will drain our lands, so that we can work a dry soil, we will not be able to work the spader satisfactorily, for the reason that, on wet soils, it would sink, from its great weight, into the soft ground.

It seems desirable that we should have plows on wheels, in such a way as to carry a man. Then we can put upon these plows the maimed soldier, the boy of 12 or 14 years, who is not strong enough to work day after day. Even the invalid could be put upon it, and made to render valuable service. But the objection

is the expense. They cost from $60 to $70. Still their use is economical in the way I have mentioned, besides they break and mix the soil together, like a garden cultivator, and as a result, we have an increase of the crop, and the great satisfaction of working with good tools.

Dr. WARDER—I would like to know if any one present has tried to use the rotary spader, and with what result.

Mr. DUNLAP—It has been tried in this county, and we find, from its great weight, that it mires in soft ground. On dry soils it has done good work.

A VOICE—It weighs 900 pounds.

Mr. DUNLAP—In regard to deep plowing, or trench plowing—a subject introduced in the lecture—I believe that deep plowing, on most soils of our prairies, produces the best crops. We find that trench plowing brings good crops. I suspect that chemistry has something to do with this. There are soils which might not be so much benefited by deep plowing. He referred to Mr. Alexander, the "big farmer," who plows eight inches deep, with good results.

Mr. LOVELL had some experience in this matter, and spoke of the practice of Mr. Sullivant, now of Iroquois county, who plowed but eight inches deep, and obtained crops of corn, 60 bushels to the acre.

Mr. DUNLAP—The soil on Mr. Sullivant's farm is, perhaps, different from ours. It is more arenaceous, is it not? A soil of this description would bring large crops without very deep plowing.

Mr. LOVELL—No, it is not such a soil as you speak of. It is very much like our soil here, I think. Perhaps it is a little more gravelly, otherwise it is much like the Champaign county lands, where the land is high.

Mr. GARDENER—I am well acquainted with one of Mr. Sullivant's foremen, and had a talk with him not long since. He stated to me that all the land that he tended yielded from 50 to 60 bushels to the acre. Some of the land was high, and some low. Take the land as it runs, I think it is much like our land.

Prof. BLISS—I have had some opportunity of observing, and also have had some little experience in this matter of trench plowing. So far as my observation goes, it has been that crops on ground not trench-plowed succeed very well if the season is favorable, but if the season is a little dry, the crop suffers, and perhaps dries up, when, if the ground had been trench-plowed to the depth

of seven or eight inches, the drouth would not have produced so damaging an effect.

Mr. ROBINSON, of Tazewell county, prepared a hundred acres of wild prairie land, and planted to corn, and obtained 75 bushels to the acre. The sod was turned over to the depth of eight inches, and turned over in such a manner as to leave holes for the air to enter, which rotted the sod much quicker than would have been the case had the sod laid down close. After the plowing, the harrow was put on. It requires considerable time to pulverize the soil sufficiently. The yield on this occasion was very satisfactory. This past season I put in a few hundred acres, on drained land, in a similar manner. The prairie was raw enough to cut a good crop of prairie grass. The soil was a little more sandy, but not black sand. The season was extremely dry, and we obtained but 40 bushels to the acre. I have every reason to believe that had the season been wet, we should have gathered 60 bushels to the acre.

Mr. FANGENROTH, of Madison county—I wish to make some statements with reference to the common mode of plowing in lands, always and forever throwing up the ridges along the outer edge of the field, and in so far scooping out a basin for water in the central portions of the field. These *dead furrows* necessitate a great loss of land.

He deprecated this method of plowing, and proceeded to describe his method. He begins in the center of the field, whether of five, ten or twenty acres, strikes his furrow, stops short of the end of his row, (distance across the field,) and then back-furrows, and continues to back-furrow till the work is done—turning *gee* if his plow is right-handed, and *haw* if a left-handed plow. This leaves the plowed surface level, throws the soil continually inward and away from the fence corners, where it is especially heaped up and *kept dry* in the old system. Another advantage in this new method. The horses do not turn on the plowed ground (but upon the unplowed) and injure it by trampling.

Mr. ROBINSON was not in favor of riding-cultivators. He had not succeeded with the gang-plows. He thought that almost all those who had given it a thorough trial had discarded it. It might answer a good purpose for that class of men—maimed soldiers, boys and invalids—of which Mr. Dunlap has spoken; but the machine is too heavy, and the weight of the driver only adds to

the difficulty. There may be gang-plows that work well, but I have not seen them.

Mr. PERIAM—But the weight of the man would not add 150 or 200 pounds to the draft of the plow.

A VOICE—Have you ever put in a crop with the gang-plow?

Mr. PERIAM—I have not. I was only speaking of the popular objection as being no very serious matter, after all.

Mr. OSBORN—I have used the gang plow, and do not like it. I have tried it for the whole season through, and still I do not like it, and I don't want to try it any more. It will kill the horses.

Mr. ROBINSON—I have seen hundreds of acres plowed with the gang-plow, and have always found the horses poor at the end of the season. Besides, four horses do not work well abreast. Yet I hope there may be some improvement in the gang-plow, for I much prefer to ride.

GRASS.

A LECTURE BY DR. L. D. MORSE, OF ST. LOUIS.

The subject assigned me on the programme is "Grass." Some of you, I presume, probably most of you, think that it is a small subject, and comparatively unimportant. Certain it is, that farmers in general bestow much less thought, care, study or science, on the grass crop than they do on the grain crop. How many farmers know the names of the grasses which are growing in their fields? Not one in ten thousand. Many of them seem to be scarcely aware that they have, or need to have, any other varieties than timothy, blue grass, clover, and rarely a little red-top; and of course they do not understand the peculiar properties and relative values of the different species, and their adaptation to various soils and conditions, and for various purposes.

Instead of my subject being of minor importance, I suspect that it would not be difficult to show that it is by far the most important of any subject that has been or will be brought to your attention during the present course of lectures. In order to present a few of the prominent features of the subject, I propose to consider,

1. What is grass?
2. The importance of grass.
3. How to grow grass.
4. Some of the varieties of grass.

WHAT IS GRASS?

1. Grass is the most common herbage with which the earth is clothed; giving us the "grassy banks," "wavy meadows," "sweet fields arrayed in living green," and the "green things growing," of which poets have sung

from time immemorial. Grass is so common, so extensive, so beautiful, so essential in the landscape, and important to the welfare of mankind, that scarcely a poetical production of rural character can be found in which allusion to grass is not made.

The family of grasses, in botanical language the *Graminæ*, embraces nearly a sixth part of the whole vegetable kingdom. Most of the grains, as wheat, rye, corn, barley, rice, etc., are true grasses. In common speech these grains are not recognized as grasses, while some other plants, such as the clovers and lucerne, are familiarly called grasses, but are not entitled to the appellation, belonging as they do to quite another family, the *leguminosæ*.

The grasses may be described as plants having a cylindrical, jointed stem, the nodes being solid and the intervening joints hollow, or filled with a pith-like substance; the leaves long, narrow, not serrated at the edges, having parallel veins running along on each side of a prominent central vein or mid-rib; the leaves alternate, one of them originating at each joint, embracing the stem with its base, and forming a sheath, which is slit down on the side opposite to the leaf to its origin; and the flowers are protected by a peculiar kind of calices called glumes or husks.

Guided by this description, it will not be difficult to recognize the true grasses wherever found, and it is readily seen that the grains mentioned belong to the grass family. It will suit our present purpose best, however, to leave the grains out of consideration as grasses, and to include the clovers among the grasses, as they are, to a considerable extent, so understood, and used for the same purpose.

A forcible and expressive definition of grass is that given by a French writer, who says that the term grass is only another name for beef, mutton, bread and clothing. A short and comprehensive definition is that of scripture, "all flesh is grass." A well known New York author, in an address at an agricultural fair, a few years ago, said:

"Grass is king. It rules and governs this world. It is the very foundation of all commerce. It is the most important crop ever grown upon the face of the earth. Without it the earth would be a barren waste, and cotton, gold and commerce all dead. Grass is the all in all to all men. No wonder then that he has always been considered a wise man who said, 'He that maketh two blades of grass to grow where only one grew before, is greater than he who buildeth a city.' That is, builds a mart of commerce—a storehouse for cotton—a place of deposit for gold."

IMPORTANCE OF GRASS.

2. The importance of grass is already quite well indicated. It is found growing throughout the world, in all places where vegetation of any kind can grow, and where grass is not found, there is found the most absolute desert—the most entire absence of the means of supporting life of any kind. Other families of plants are restricted to narrow belts of latitude, but the grasses everywhere spring up spontaneously, adorning the earth with refreshing verdure, and affording the chief means of subsistence for almost the whole animal creation.

An all-wise Providence has wonderfully provided for the propagation of this class of plants. The seeds are small, light and easily transported from one place to another. The roots are creeping or fibrous, and send forth many shoots which quickly cover the ground; and by the yearly decay of the stems and leaves a constant supply of decomposing matter is afforded for the nou rishment of future growth. Most of the grasses are perennial, and although the leaves and stems be cropped and destroyed, they are soon reproduced. The creeping roots, though bruised and hurt, are not destroyed, and the winter's cold and summer's drouth are alike unable to extinguish the principle of life in these most important of all plants to mankind.

The great value of the grasses is further signified by the wisdom of Providence in the great number and variety of the species which he has created. There are no less than three thousand distinct varieties known and described by botanists. Thirty varieties have been counted in a single sod taken from a rich natural pasture. Mr. Flint, author of "Grasses and Forage Plants," describes one hundred and twenty-five varieties growing in the state of Massa chusetts. In the Natural History of New York, Prof. Torrey describes forty varieties of the genus *Poa*, twenty-seven of *Agrostis*, six of *Alopecurus*, fifteen of the *Festucas*, and thirty-four of other varieties, amounting in all to one hundred and twenty-two varieties existing in the state of New York.

Six tenths of the whole cultivated area of the state of New York is occupied by grass; and the annual value of this crop may be fairly estimated at $75,000,000; an amount fully equal to, and probably exceeding, the value of the entire grain crop of that state. Where, within the United States, can be found more beautiful or more wealthy localities than in the best grass-growing districts of New York? How often do we hear the remark from men who have traveled much and observed closely, "wherever you find a good grass farm, you are sure to find wealth and prosperity." Mr. Samuel L. Boardman, of Maine, has written as follows: "A district of country which is exclusively or mainly a natural grass-growing section, has within itself all the elements of successful agriculture, provided its operations are conducted with system and economy. With grass we have all kinds of stock; with stock the means of working and dressing our farms, furnishing our tables, providing our clothes, and all else that is desirable or necessary. A county having a soil naturally adapted to grass, is, in a great measure, able to live within itself, and not be dependent upon an exchange of commodities with other districts. The same is true, though in a less degree, upon a single farm. If the soil is natural to grass, strong and moist, the farmer has at hand the means to secure whatever he desires; or, to apply the old proverb, he has corn, cattle and manure. In fact, grass and stock husbandry is really the only branch of farming which seems to render a man independent."

A committee of the Maine Board of Agriculture, reported to the board in 1864, as follows: "We have no hesitation in saying that the hay crop of our state is far the most valuable and important crop that we produce, and generally all our farm operations, particularly in the older portions of the state, should be conducted with a view to increase the fertility of our grass lands, and augment the hay crop. We believe that the thrift of those who attend

to farming exclusively, and who pursue a mixed husbandry, as do most of the farmers of this state, may be very correctly estimated by the amount of hay they cut."

Scores of such opinions as these could be given, and there are ample facts to prove that they are well founded. If so, then it is evident that the most serious and radical defect in our Western agriculture is, that too little attention is paid to growing grass. It is a defect that is becoming year by year more serious, and unless a change in our system of farming is inaugurated, the utter impoverishment of a very large portion of our beautiful and naturally fertile country is merely a question of time. Indeed, a number of counties in the State of Illinois are already measurably worn out and exhausted by bad management, and chiefly by the continual cropping with grain.

Illinois is claimed to be the best agricultural state in the Union. It has been called a great cattle raising state. Statistics show that it is most emphatically a grain producing state. Illinois produces annually over ninety bushels of grain to every individual of her population, while the state of New York produces only about nineteen bushels to each individual of her population. New York is a wealthy and very prosperous state. In her agriculture, I think it will be generally admitted that she is in advance of any other state in the Union. Her farmers generally pursue their calling with as great a degree of intelligence and success as the farmers of any region on this continent. It becomes an interesting inquiry then, in what consists the prosperity of New York, while she produces but little more than a quarter as much grain in proportion to population as Illinois.

In comparing other products the proportion cannot be so readily adjusted as with grain. Illinois is larger than New York in area, by some ten or twelve thousand square miles. The population of New York numbers a little more than twice as much as Illinois. According to the census of 1860, Illinois raised considerably more than twice as much grain as New York, the figures being 156,219,448 bushels in Illinois, to 72,890,861 bushels in New York. Illinois produced 1,774,554 tons of hay, to 3,564,786 in New York, or about half as much. There are more acres in pasture in New York than in meadow. In 1865 the figures were 4,296,720 acres of meadow, and 5,819,694 acres in pasture. If the yield from the pastures is worth as much as the yield from the meadows, then the grass crop produces more money probably than the grain crop in New York state; while in Illinois, estimating by the same rule and at the same rate—which is much too liberal—the grass crop is not worth half as much as the grain crop. In 1860 the live stock in Illinois was valued at $72,501,225; in New York, at $103,856,296. Illinois had 522,634 milch cows, while New York had 1,128,624.

It appears that in all products from grass, New York is largely in excess of Illinois; and yet not very much in excess of her own grain crop in value. She practically recognizes the old Belgian proverb, "No grass, no cattle; no cattle, no manure; no manure, no crops."

It appears evident, also, that the farmers of Illinois depend for their profits chiefly upon growing grain. This is sent away to market; most of it finds its way to the Eastern States, and not a little of it goes eventually to

enrich Eastern grass farms. Of course it brings money to our farmers, though it is doubtful whether it brings as much for the time being as grass would; but the most important point which should be considered is the end to which such a course inevitably leads—such a continual sending away of the wealth of the soil never to return.

You have all heard of the peasant who possessed a goose that every day laid a golden egg. This small supply of gold was sufficient for the daily wants of the peasant and his family, and their only care was to preserve the life of the remarkable animal from which they derived their support. But at length the peasant, stimulated by unnatural desire, required more gold, and unwilling to wait the tardy operations of nature, cut open the body of the goose to obtain the coveted treasure, and thereby killed the animal and lost his means of support.

The soil is the goose that annually lays a golden egg in the lap of the farmer, and will continue to do so to all time if properly fed and tended, but the practice of many of our grain farmers will as surely starve and destroy the goose as did the knife of the peasant in the fable.

The preservation of the fertility of our soils, and the profitable and even increased production of the cereals, both of which objects may be secured by the growing of grass extensively, and by the manure resulting therefrom, are certainly matters eminently important and worthy of our consideration and study.

"The effect of grass on the growth of the cereals is well illustrated by a comparison of the agricultural statistics of France and England. France has fifty-three per cent. of its cultivated area under grain crops, while England has but twenty-five per cent.; but in grass and meadow, the natural food of live stock, England has fifty per cent. and France has only twenty-two per cent. You may be surprised to hear, that notwithstanding the enormous disproportion of area of grain land, England produces 5 1-9 bushels of grain for every individual of her population, while France produces 5 ⅛ bushels for every individual of hers. Thus the production of the former is within seven-eighteenths of a bushel of the latter to each head of her population. How is it that England is so nearly on an equality of production with France, while her cultivated area is very much inferior? The answer is plain. It is on account of the manure furnished by her grass lands. Every acre of English grain land receives the manure from three acres of grass, while in France the manure from each acre of grass must be diffused over two and a half acres of grain. Let not the eloquent teachings of these plain statistical statements be lost upon us. Let us ponder them carefully when contemplating the splendid rewards which nature offers for a thorough obedience to her laws." (Address of J. Stanton Gould.)

HOW TO GROW GRASS.

3. It is not the simplest thing in the world to grow grass with complete success, though judging from the examples most commonly seen, it might be presumed that it is generally so considered. Without going very much into

the details of grass growing, I wish to mention a few essential considerations, most of which are too commonly neglected or overlooked.

First, underdraining, on a large portion of our lands, is essential in order to secure the best results in grass.

On all heavy soils, with retentive clay sub-soil, that hold the water that falls until it evaporates, and on such lands as are full of springs, the grass crop will be doubled, on an average, considering quality and quantity, by underdraining. It deepens, ærates, warms and enriches such soils in a wonderful degree, making them capable of withstanding the effects of cold, wet weather, and especially it enables them to go through the long, scorching drouths without material injury to the crop of grass. It is expensive, but when well done will last a life-time, and the increase in production will very soon pay the cost.

In the second place, it is essential that the ground be properly prepared for the reception of the grass seed. It should be smooth, in fine tilth, and free from weeds and foul growths of all kinds. We rarely find a pasture or meadow that is not more or less filled or infested with noxious weeds or worthless grasses. These occupy and take the strength of the land, continually encroaching upon the valuable grasses until the pastures, and especially meadows, become almost worthless from the abundance of "white weed" and other trash. He is not a successful grower of grass whose pastures and meadows are thus infested.

Plowing in midsummer, the summer fallowing as sometimes practiced, puts the land in good clean condition for seeding to grass in August or September. A crop of sowed corn may be grown to the height of a foot and a half and then turned under with the plow, if desirable, affording manure and clean land for seeding, Sowing grass seed upon oat stubble, as I have found it practiced in this immediate vicinity, I think must be an excellent plan. The oats, if sown in February or early in March, as they must be to succeed well in this latitude, and especially south of this, get an early start, and quite effectually choke out most of the weeds. Then, if the grass seed be sown on the stubble early in September, either with or without harrowing, it gets a good start before winter, and the oat stubble and the young oats that start from the seed scattered in harvesting, afford some winter protection to the young grass. Good success is sometimes obtained by seeding to grass in February or March, but is generally considered much more uncertain, and so also is the practice of sowing grass seed with grain.

These hints in regard to preparation for seeding, apply generally to meadows, and in most cases to pastures. Circumstances alter cases. There are hill lands that may be properly seeded to grass as soon as cleared, without plowing even, and kept constantly in grass. Weeds, sprouts, etc., may be killed out of such pastures by mowing or cutting out, or much better by pasturing with sheep. Our unbroken prairies may be seeded with grass, and thus converted directly into better pasture or meadow than they were before; and in a few years the tame grasses will almost entirely take the place of the wild.

One very important cause of lack of better success in growing grass is that farmers do not sow varieties enough. This is true in more than one sense. Different varieties should be chosen for different objects, for difference in season of ripening, and different soils. Again, a mixture of varieties should generally, if not always, be sown.

Some of the grasses flourish on dry sandy or rocky soils, but perish in wet soils; others grow vigorously in wet soils, but die in drier ones. Some will only flourish on alkaline soils; some require excess of potash, others excess of light. Some are adapted to the sunlight, others love the shade; some are valuable for hay, but not for pasture, and vice versa. One species abounds in that kind of nutriment which enlarges and strengthens muscles; another, ill adapted to nourish the muscular tissues, will lay on fat rapidly; another which is deficient in both these respects, is rich in those elements which support respiration and furnish the fuel for the production of animal heat. Certain varieties are highly valued for making a superior quality of butter. It seems very evident that in the judicious selection of different varieties of grass, to occupy different localities, and to subserve different purposes, a wide field is afforded for the application of physiological, botanical, geological, meteorological and chemical knowledge. It is the province of practical agriculture to find out the peculiar qualities of each variety, and to place each in the locality and under the circumstances most favorable for its most profitable development.

We should sow a mixture of varieties, for several reasons; one is that it is an object to produce as much good herbage from the land as possible, and at various seasons; another is the importance of occupying the ground as completely as possible with valuable grasses, so that noxious weeds and worthless grasses will have no chance to get a foothold. It is an established fact, and one easily demonstrated, that one or two varieties will not perfectly occupy any soil. This is the rule, to which there may be exceptions. Different soils vary in the number of plants of a certain variety that they are capable of maintaining; yet, on any soil, however thickly the seed of a variety may be sown, only a certain portion of the plants will live; the rest perish and leave vacant spaces of soil, which eventually become occupied by foul grass, weeds or moss, more or less to the detriment of the grass crop. Therefore, by neglecting to sow a sufficient number of varieties, we fail to obtain a full yield of grass, and what we do obtain is deteriorated by the mixture of weeds, the tendency of the latter being to increase and encroach upon the grass.

Mr. Flint says, "I hold this proposition to be indisputable, that any soil will yield a larger and more nutritious crop if sown with several kinds of nutritious grasses, than when sown with only one or two species. Indeed it is a fact, well established by careful experiment, that a mixture of only two or three species of grasses and clover will produce a less amount of hay than can be obtained by sowing a large number of species together. There may be some exceptions to this rule, as in the cases where the yeld of timothy and red-top, owing to the peculiar fitness of the soil for them, is as great as can stand on the ground where they grow."

Mr. Flint gives several lists of mixtures recommended for pastures and meadows, varying in number of varieties from nine to sixteen. In all natural and old pastures we find quite a number of varieties of grasses growing together in all cases. This is nature's plan for completely occupying the soil, and every farmer who observes carefully will be convinced that it is an essential point of success in grass-growing.

One more essential consideration in regard to success in growing grass, I will mention lastly, though not by any means of least importance, namely, the planting of trees, and the preservation of forests. Every pasture should have upon its borders, and upon the highest points, a sufficient number of trees for the comfort of stock, especially to protect them in the heat of the day from the scorching sun. Meadows may be bordered by trees, and a few scattering ones in the field will not be badly out of place. But these are minor considerations compared with the importance of growing and preserving trees for their ameliorating influence upon the climate. One of the most serious obstacles in the way of successful grass-growing is the long and scorching drouths to which our country seems to be more and more subject.

"The researches of modern science," says Professor Kedzie, of Michigan, "accurate and careful observation, as well as the history of the past, show that a country abounding in forest is more moist, has a more copious and equable rainfall, abounds more in springs and streams, and, in consequence of all these, is more exempt from great and sudden fluctuations in temperature, from late frosts in spring and early frosts in fall. Thus Egypt, from earliest periods of history, has been spoken of as a rainless region; but since Mahomet Ali has made his immense plantations of trees, showers have become frequent. The controlling influence of forests over rainfall is also shown by the fact that countries once supplied with forests, and having abundant rains and immunity from frost, their forests being destroyed, have been scourged by drouth and frost till the forests were restored, when they once more became fruitful; or, if the inhabitants would not restore their protecting forests, the stern hand of famine threatened to wipe out a race that would not reverence the order of nature. Thus the Cape De Verde islands, so named from their greenness, have been stripped of their forests by their improvident inhabitants, since which time they suffer terribly from periodical drouths; sometimes no rain falling for three years at a time, and 30,000 inhabitants, or one-third of the population, have perished. Thus famine cuts down the inhabitants as pitilessly as they cut down the protecting trees."

Abundant evidence can be found in our own country in proof of the favorable influence of forest upon the climate. There cannot be one present who has not vivid and painful recollections of long periods when the pastures were as heaps of dust, and when every living thing seemed in danger of famishing almost for want of a green thing to eat. It is safe to say, that in one hundred years from now, unless more attention is paid to tree planting and the preservation of forests, the farmers of this region will not be able to make a living from their lands.

4. The importance of studying the varieties of grasses has already been stated. It is a subject of too great magnitude to admit of being thoroughly presented at this time. A few prominent features only, in regard to the varieties and their uses, will be presented.

The importance of using a mixture of varieties in seeding to grass has been stated. We should also seek to stock our pastures, and especially our meadows, with the most nutritive grasses. To aid us in this respect, we have the experiments of Mr. Way, the chemist of the Royal Society of England, who has given us an analysis of twenty-one varieties of grass, and has thus disclosed to us, as well as chemistry can do, their relative values for feeding to animals. These experiments constitute, probably, the most valuable contribution which chemistry has ever made to agriculture. From these experiments we learn with surprise that one hundred pounds of quaking grass will give 28½ pounds more of dry hay than one hundred pounds of vernal grass; that it will require 237 pounds of vernal grass to supply an animal with as much muscle-making matter as is afforded by one hundred pounds of Timothy. It will take 319 pounds of soft brome grass to lay as much fat on an animal as 100 pounds of timothy would do. One hundred pounds of timothy will support the respiratory process as long, and afford as much animal heat, as 260 pounds of vernal grass. Chemistry teaches us, what every observing farmer knows, that timothy is the most valuable grass that we have, especially for hay. It is much to be regretted that further experiments like those of Prof. Way have not been made, and also that the chemical results have not been thoroughly verified by actual experiments at the manger, conducted with care and precaution to guard against mistakes. Such investigations, regarding the nutritive value of the different species of grasses, would help to determine important questions relative to agricultural profits.

In the next place we should select varieties for our meadows with reference to their period of ripening. It is often, if not generally, important to have the meadows of a farm come successively to maturity, and with this end in view, we should sow such varieties together as flower at the same period. Hay is most nutritious and most palatable when cut at the period of flowering. I am aware that this is to some extent a disputed point. There are many farmers, especially in the West, who believe that timothy should not be cut until it is ripe. They say that it gives more weight of hay when left until it is ripe, which is doubtless true, but that its value is thereby lessened, there is scarcely room for doubt. Chemical analysis, and the practical trials of the best farmers in the oldest grass-growing regions, concur in showing that the period of flowering is the best time to cut grass for hay, having reference to its nutritive value. At this time it contains more starch, sugar and albumen, which can be assimilated by animals, than at any other period; after this, these substances are converted into woody fiber and other compounds, which cannot be favorably acted upon by the digestive organs, and are, therefore, wasted. If reference is had to the best authorities in this country or Europe, it will be found that they all agree in considering this an

established principle. At the discussions held during the New England fair in September last, this subject came up, when very many of the farmers of New England, where grass is the leading crop, most emphatically urged the importance of cutting timothy at the flowering period in order to secure its maximum value. Considering this point established, it follows that great loss must be sustained by cutting together those grasses which flower at different periods. If cut when the earlier grasses are in the proper condition, the later ones are watery and innutritious. If cut when the later grasses are in flower, the earlier have passed into woody fiber and other insoluble compounds. We see an example of this want of fitness in the practice, common all over the country, of sowing timothy and red clover together, the clover being much the earliest.

If orchard grass and red clover are sown together, a much better crop for early mowing is obtained. Again, it follows, with farmers who have a large quantity of meadow, that if they are restricted to one or two varieties, great loss must be suffered for want of help sufficient to cut it all when in its best condition, the period of flowering; and every day that it stands after this diminishes the nutritive value. To prevent this waste, meadows may be so divided, and such varieties selected, as to have part come to maturity in June, another part in July, and the remainder in August.

In regard to grasses for pasture, the case is quite different. The period of flowering of the different varieties in the pasture should differ as widely as possible. It is important to have those varieties which will afford the very earliest growth of herbage in the spring, and then to have a constant succession coming to perfection in every month from spring to fall.

I will not weary you with descriptions of varieties of grass, but will name a few which may be considered as adapted to the various purposes alluded to. In order to obtain a succession in meadows, on the principle pointed out, the following varieties may be taken for a beginning:

For early mowing, and for light sandy lands.—Orchard grass, red clover, annual spear grass, meadow foxtail.

For later mowing, and for clayey and calcareous loams.—Timothy, red-top, crested dog's tail, tall fescue, hard fescue, Italian rye grass, and oat grass.

For latest mowing, and for clayey lands.—Wire grass (*Poa compressa*), and foul meadow (*Poa serotina*).

These different mowings will occur in the months of June, July and August, later or earlier in the months, according to latitude.

For seeding lands for meadows or pastures, a few leading varieties may be mentioned as adapted to different soils.

For sandy soils.—Lucerne, though a legume, and not a true grass, is admirably adapted to sandy soils resting on porous subsoils; meadow foxtail, orchard grass, Italian rye grass, hard fescue, tall oat grass, meadow soft grass, and the red and white clovers.

For calcareous loams—especially adapted—Kentucky blue grass, timothy, and annual spear grass.

For tenacious clays.—Perennial rye grass, crested dog's tail, red-top, wire grass, and tall oat grass.

For permanent pastures, with a view to securing a succession in the time of blossoming, covering as much of the season as possible, Mr. Flint recommends the following mixture, giving the number of pounds of each for an acre:

Meadow foxtail,	flowering in May and June,	2	pounds.
Orchard grass,	" " "	6	"
Sweet-scented vernal	" in April and May,	1	"
Meadow fescue	" in May and June,	2	"
Red-top	" in June and July,	2	"
Kentucky blue grass	" in May and June,	4	"
Italian rye grass	" in June,	4	"
Perennial rye grass	" in June,	6	"
Timothy	" in June and July,	3	"
Rough stalked meadow	" " "	2	"
Perennial clover	" in June,	3	"
White clover	" from May to Sept.,	5	"
		40	pounds.

This gives us forty pounds of seed for an acre, and twelve varieties; and would give, according to Mr. Flint, over 54,000,000 seeds! "In an acre," he says, "there are 6,272,640 inches, so that the mixture would give about eight seeds to the square inch." This he considers a very large and liberal seeding, allowing a large margin for worthless seeds, for imperfect sowing, and for destruction of plants by insects and frost.

In conclusion I must say that I have sincerely regretted having had at my command so little time—merely odd hours snatched from other duties—in which to prepare a subject of such primary importance to our agriculture, and in regard to which there is so much need of awakening more interest among Western farmers. If, however, I have presented facts and thoughts sufficient to induce any farmer to study the subject who has heretofore neglected to do so, he will probably supply himself without delay with such a work as "Flint on Grasses," where he will find very much of what I have stated in this lecture, and a vast deal more, of the greatest importance for him to know. It has been wisely said, that he who makes two blades of grass grow where but one grew before, is a public benefactor. I have at least made an effort to accomplish something in that direction, and I hope that each of you will become public benefactors by contributing to double the amount of grass now produced.

DISCUSSION.

Mr. FREEMAN, of South Pass—I would like to ask the Dr. a question. Whether there are two species of red-top?

Dr. MORSE—No, sir; I think not. We find that grasses vary greatly, according to the soil in which they grow. If upon thin soil, it does not grow more than one and a half feet high. If on rich soil, it grows large, and the general appearance is such as leads one to suppose that there are two varieties of red-top, when there is but one.

Mr. Dunlap—There were one or two points in the lecture that struck me with force, and some statements made that I would not like to have go out without explanation, and which seem to be indorsed by the speaker. I understand him to recommend sowing forty pounds of mixed grass seed to the acre. Now, if we look at it in the light of dollars and cents, we find that the expense is great. This gives no encouragement for commencing grass culture. Now I think a much less quantity of seed is sufficient. I find that four quarts (of timothy?) is better than three pecks, if properly sown. We can dispense with three-fourths of the quantity named. It is the practice of some to sow in the spring, with other grain, especially with oats.

The gentleman tells us that timothy is the most valuable of the meadow grasses, yet he tells us in conclusion that June grass, mixed with timothy, is equal to timothy and oats. I suppose the gentleman can explain this. Let us understand this matter. We know this June grass under the name of Kentucky blue grass. It is not especially adapted to calcareous soils. It is known in New England as June grass. It is known in Ohio as June grass (*Poa compressa*). The question as to whether it is profitable grass in the meadow, is not doubtful. It is indiginous to this country, and makes good pasturage. We can make just as good butter and milk as Orange county, New York.

Dr. Morse—In reference to the points stated by the gentleman who has just taken his seat, I would say farmers generally sow too little grass seed, and I would prefer to recommend too much rather than too little. In my practice I sow more than my neighbors do. I wish to have the ground completely covered. Thick sowing does no harm. In regard to the cost, I believe every farmer raises his own grass seed, or ought to do so. Many varieties he cannot buy. Besides, if he sows his own seed he knows what he is getting. If he buys his seed, he does not know what he is getting; he not unfrequently gets weeds. If the farmer will save his seed he will avoid the cost and be sure of pure seed. In the experiments of Prof. Wade, timothy is the best for hay, and blue grass the best for pasture. He read extracts from authorities on this subject, indicating the difference and comparative value of Kentucky blue grass and June grass, the one having a hollow stem and the other being solid. Working horses can not be kept on this? grass.

Mr. DUNLAP—Is there not here a reference to green feed alone?

Dr. MORSE—I think there is.

Mr. DUNLAP—That will explain it.

Mr. PERIAM—I think theories and facts are both valuable, but facts are better than theories. In regard to the difference in these grasses—that which is known in the East as June grass and Kentucky blue grass. That there is a difference in these two grasses I receive as a fact. In New Jersey, where I was raised, this so-called wire grass, or June grass, is worth double that of timothy, especially for what are called fancy stock, and raising of horses. In reference to thick and thin sowing, I would say half-bushel to the acre was enough.

Mr. SCOTT—I have some little experience in this matter. I was born and raised in the state of Kentucky, and came to this State some years ago. I noticed a difference in these grasses, and I frequently asked persons if there was a difference. There was evidently a marked difference in the appearance of them. Afterward I sent to Kentucky and bought seed and sowed it, and also sowed the seed saved from the farm, and there was a very marked difference in the quality of the two grasses. As to the quality of the Kentucky blue grass, I think it is, for grazing purposes, unsurpassed.

Mr. ROBINSON—For hay, I find nothing better than timothy, clover, and, on low land, red-top. As to the quantity of seed, I should say one bushel to the acre, if the ground is properly prepared. This will give a seed to every square inch, which is enough. Also, in reference to the different kinds of grasses, I think there are three varieties similar to the blue grass—one of larger growth, another of smaller growth, and a third which stays green all winter. It does not exceed six inches in height. We find a considerable of it along the Illinois river. It is worthless as hay, but good for pasture.

Mr. FREEMAN—I got hold of Mr. Talpa's little book, "Chronicles of a Clay Farm," about ten years ago. I took particular notice of what he said about the different kinds of grass, and the soils best suited to each. I then made a selection of six or seven varieties, those which I thought best adapted to my soil, mixed them together, and sowed the seed with the best results. I had a magnificent growth. In this mixture I had Kentucky blue grass,

orchard grass, red-top, red clover (I did not put in any timothy), sweet scented vernal grass, and some other varieties.

In regard to the time of sowing, I think the spring is best with us, owing to the heavy action of the frost. Our soil is not as moist as that of Central Illinois. We prefer to prepare the soil in the fall and sow in the spring, say in February or in March. Last summer, along the banks of the Big Muddy, in Williamson and Jackson counties, I saw fine fields of red top—forty-acre fields of red-top—presenting a fine growth. In a few instances timothy grass was seen, but chiefly red-top. I found no one to talk about it and give me information. The subsoil in particular is much the same as Cobden Ridge, but the situation is especially favorable to the growth of this grass. The soil there is, I think, always moist. It is certain that it was, in the early part of the season, excessively wet.

Mr. DUNLAP—In relation to this quantity of seed, I would like to have it understood as to what is the proper quantity. Take it for granted that a man can raise his own grass seed—and he *can't* do it—I still think it would be better to use one-fourth the seed, and sell the balance. The difficulty is the sowing is not properly done. The seed is scattered upon a half-prepared soil and covered too deeply. I protest against the very common mode of sowing grass seed. It is not good farming. Grass seed, buriedone inch in depth will never germinate, but if properly done every seed will germinate. The land should be well plowed and then rolled, the seed sown and again rolled. This will cover the seed to a sufficient depth, and I will guarantee that one-fourth the quantity of seed will make a better stand than the whole sown in the ordinary way. This method also commends itself in that it is less expensive.

Another word in regard to the Kentucky blue grass and its identity with our June grass. I have the statements of good judges that, when grown side by side, they were to all appearance identical. The only difference I can see is, that we find in the one ergot or smut, and do not find it in the other. I have never seen ergot in the wire grass (*Poa compressa*). There are doubtless three kinds, or more, of grass upon this park. There is more or less of red-top, and several other grasses I do not know, and among them are some of the wild grasses. I am satisfied that the best seed comes from Kentucky, and this will account for

the seeming difference as to variety. The subject needs further investigation and trial, which we expect will here be given to it. This institution has a thousand acres of broad prairie, upon which we expect to test the value, not only of grasses, but of many other things.

Dr. WARDER—This question with regard to these grasses goes to show how intelligent farmers may aid us, by their observations, in arriving at truth. Yet we may derive much aid from scientific research in a direct line I am happy to learn that there is a memorial, asking the Legislature of this State to provide for a Botanical survey of the State. This question would be answered in a moment by one who had made the survey. One observation could not furnish the data upon which to base our conclusions.

The Kentucky blue grass is undoubtedly the same botanical plant (*Poa compressa*) as the June grass of New York and the spear grass of Pennsylvania. For pasture it is very highly valued; so much so that meadows where this grass abounds are often, after three or four years, turned into pasture. It is very difficult to cut this wire grass. I once asked a farmer if he knew this grass. He shook his head suggestively. He did not *want* to know it. "We call it," he said, "wire grass; when you strike your scythe into it you will almost fall over." But this grass is extensively used in Ohio as pasture, for which it is very valuable. It is a common saying in Pennsylvania that a pound of blue grass will make an ounce of beef. I hope something will be done in the way of obtaining a Botanical survey.

Mr. PERHAM—I wish to call attention to one more point. I have always held that the grass crop was an important and profitable one upon the farm. One-half the farm should be in grass—in pasture and meadow—and the grain raised should be fed upon the farm, for the reason that the manure may be put back upon ground. This is a fundamental principle in English husbandry. We know that the grasses and the turnip crop have done everything for the English soil. They have increased the productiveness of their farms one-half within the present century. I wish to call the attention of our farmers to this subject. We are depriving our soil of its fertility year after year, and the probability is, unless we change our practice, that within the next century it will become so barren that it will be hardly able to support the increased population which will follow from emigration to this country.

CORN.

ADDRESS OF M. L. DUNLAP.

Ladies and gentlemen: The few remarks that I propose to make on the subject of corn will be mainly devoted to its culture, leaving the analysis of soils, manures and the crop itself to other hands.

It is my purpose to deal with facts rather than theories; not so much what it is possible to accomplish as that which will make the best returns for our labor.

It is estimated that the wheat crop of 1868 amounted to 225,000,000 bushels, while that of corn figures up the enormous quantity of 900,000,000 bushels, or nearly four times greater. In 1866 the total crop in the United States of this grain was reported at 880,000,000 bushels, of which this State produced 155,844,350 bushels, nearly one-sixth of the entire crop of the whole country, being an average of 31.6 bushels to the acre, on 4,931,783 acres, and valued at $67,013,070.

We have no official figures for the crops of 1867 and 1868, but that of 1867 must have been considerably in excess of that of 1866. The entire value of this staple of the farm for 1866, including also wheat, rye, oats, barley, buckwheat, potatoes, tobacco and hay, in the State of Illinois, were estimated at $160,148,704; deduct the corn, $67,013,070, and we have for the other staples named, $93,135,634.

These figures show the great importance of this crop to the people of the State, and must place it at the head of our agricultural resource, not only for domestic use, but for export.

WHAT WE DO WITH THE CROP.

Chicago is called the most extensive grain market in the world, receiving a large share of the surplus of our crops from at least the north half of the State; yet for the year 1866 the shipment of corn from that point was only 25,288,526 bushels, a part of which came from Iowa and Wisconsin. We also ship East by various railroads, and South by the Mississippi river. On the whole, we must ship less than one-third of the crop, the remainder being used for domestic purposes, the manufacture of highwines, and the feeding of pork and beef. If we estimate that one-third of the crop is manufactured into highwines, beef and pork, this gives us a double profit, adding to the value of our pasturage and manufactures.

To this source we must attribute the greatest share of the prosperity of the State, in supplying the sinews of commerce, that have enabled us to stand the crash of commercial disasters, among which may be classed those of 1857, 1861 and 1862, memorable years to the business of the country, when the currency of the State melted away like dew before the sun; but, thanks to the potent power of the corn crop, the stream of business was again supplied, and the State moved forward with a steady progress.

THE AVERAGE YIELD.

The average yield for the State is put down at 31.6 bushels for the year 1866; Indiana, 36.5; Ohio, 38; Michigan, 32; Kansas, 34; Nebraska, 29; Maine, 33; Massachusetts, 34; New Jersey, 43.3. As we go South we run down the scale, South Carolina being 5.9; Georgia, 6.2; Alabama, 9, and Louisiana 17 bushels per acre.

If we take these statistics for our guide we must consider New Jersey the best, and South Carolina the very worst state for this crop. The general average being 25 bushels to the acre, this State is but a little above the average, notwithstanding its rich soil and genial climate; the fault being in our superficial culture. While we should stand first on the list, we are in fact the twelfth, five out of six of the New England states leading us in the yield per acre.

This condition of things is not very gratifying to our Western pride, but as it is a condition of things within our power to change, we should address ourselves to the task. When we boast of our millions of bushels of this staple we ought to keep out of sight the millions of acres that we run over to obtain the quantity. But I fear these ugly figures will continue to be paraded before us until we change the result by improved modes of culture.

THE POINTS INVOLVED.

At present we are under no particular necessity to produce the greatest yield that the soil is capable of, without regard to cost; for population makes no such demand upon us, nor will such a course prove the most profitable. We must therefore seek for the best returns for our labor and our capital. When land is cheap and labor dear, we may use more land and less labor to produce a given quantity of grain, and thus receive as large a percentage on the capital invested; but as land grows dear this plan of management must be changed to conform to the changed condition of things.

If the New England states produce more corn to the acre, it does not follow that they produce it at a less cost; on the other hand, we know that we can deliver corn at any point on the seaboard at a cheaper rate than they can, a fact that is daily demonstrated.

The profit of any crop is the sum that it commands in market over and above its cost. Now what most interests us is to widen this margin, and there is but one way in which we can do it. We cannot raise the price in the market, for that is a matter regulated by many other considerations besides the quantity of the particular crop on sale. As we cannot raise the price, and thus widen the margin between the cost of production and that at which it is sold, we must see if it is not possible to reduce the cost of producing the crop, either by lessening the cost per acre, or to increase the yield, without adding to the cost, by a better system of management and of culture.

In the first place, that part of the crop that we consume for the ordinary use of the farm, such as the feeding of teams, pork and beef for the family, is not affected by the market price; but the surplus, that which must find a

market, to be exchanged for other needs, is the subject of further consideration. Shall it be sold in bulk or fed to animals and sold in the form of beef and pork? And yet, in this case, if so fed, how shall it be done? In the ear, in the shock, or sent to the mill and ground, and then fed raw or cooked?

These are all questions pertinent to the subject, and must have a place in considering the margin of profit. For this part of the subject we have not the time at command, and will leave it until we come to the subject of the feeding of cattle and hogs for beef and pork, and the manufacture of high-wines.

SOIL FOR CORN.

This grain may be considered the staple crop in all parts of the State, and is grown on every farm from Cairo to the Wisconsin line, and in nearly every case with a view to a surplus for market, either in its raw state or its products in beef, pork, mutton, butter or poultry. We may then say that all the various soils of the State are suited to its profitable production. This is true as a general thing and to a certain extent, but it would not be good advice to recommend corn as the leading crop on every farm and under all conditions of things; yet every farmer will find it profitable to a certain extent in a rotation of crops, in all parts of the State, and in every variety of soils; whether in the driftless region about Galena, the loess, the prairie drift, the modified drift, the arenacious flats or the river deposits, all are more or less valuable for this great staple of the West.

SCIENCE VS. ART.

Until within a few years the culture of the soil, and especially the culture of this crop, was an art only to be acquired by a long toilsome apprenticeship, and had this university been established before the days of Liebig it would have been simply a manual labor school, or a farm for the practical teaching of farm apprentices, but since the application of chemistry and vegetable physiology to rural industry, the culture of the soil is taught in the schools on the same general plan as that of any other science. This school having been established for the teaching of those branches of learning relating to agriculture and the mechanic arts, it is your business to teach the science relating to these departments, rather than the arts themselves. I could not be expected to take this audience into the field, or march them over the State, to point out the various soils, and to have them demonstrate their relative value by direct application, but we may teach them the science upon which rests their success, when they return to their several homes and apply these theories to the art of culture.

A NATURAL CORN SOIL.

Climate has much to do with this crop, while soil is also to be largely taken into the account. I have shown that the stony and comparatively sterile soils and frosty climate of New England produce an average cereal product above

that of our rich prairies and genial climate, thus proving that there are certain conditions, subject to our control, that have much to do with results.

A natural corn soil must be rich, well drained, and capable of withstanding drouth. Such a soil is the

LOESS OF OUR RIVER BLUFFS.

We always find "Illinois River" corn to command the highest price in the Chicago market. It matters not how indifferent the crop may be in other parts of the State this corn is always graded No. 1, or "extra," always produces a good crop, and is always reliable. When the general crop is poor the millers inquire for this corn, and if it is not on the market a man is started down the river, in the neighborhood of Lacon, Beardstown or Havana, for a supply.

The reason of this superiority is mainly in the mechanical condition of the soil. It may not be any richer in the elements of plant growth, but it is thoroughly comminuted and drained, and hence is in a condition, at all times, to be plowed or cultivated. The spring rains do not retard the planting, nor do they prevent culture for the killing of weeds. In this respect it is like sandy soils in a high state of fertility, with greater power of resisting drought. This soil covers no large area, but is found in patches along the rivers, sometimes mixed with the drift, and sometimes underlying it from one to ten feet, its presence always affecting the soil with which it comes in contact.

For the culture of the vine and orchard products it is held in high esteem, while for corn, from the first settlement of the State, it has continued to maintain the superiority over all other soils. With such a soil, all we have to do is to plant early and keep down the weeds, and the crop will be assured.

The depth of plowing on this soil is a matter of little moment, for the roots easily penetrate to any desired depth, as the soil is always friable and readily penetrated by the rains, and never holds stagnant water. It can, therefore, never pack, even if plowed immediately after a heavy rain, as in the case of our rich loams and heavy clays.

We may take this soil as the standard for the corn crop, by which to measure the relative value of other soils, and by which to change them by artificial means so as to approximate their value.

To add sand and organic material to the clay soil to make it correspond to the loess, is practically out of the question; but we can underdrain this soil and add fertilizers, so as to put it in a condition that it may produce good average crops, perhaps equal in value, though at an added expense.

If we had sufficient area of loess on which to grow all the corn required, it would be the best possible arrangement, and beyond competition; but such not being the case, we must make the best of such soils as are at hand.

This leads us to the consideration of

TILE DRAINING.

We all know that the gasses that are washed out of the atmosphere by the falling rain have a stronger affinity for the soil than the water when the wa-

ter can pass through the soil. This absorption is effected naturally in the loess, but not so in the clays or clayey soils. The water cannot pass off through them without artificial assistance, and this is accomplished by the aid of tile, laid deeply in the subsoil and offering a free outlet to the water, the soil holding the gasses on account of its greater affinity to them. This is one of the principal reasons for the uniform fertility of loess formations, as they always retain the ammonia and other gasses of the rainwater. It will be seen that tile draining has a similar mechanical effect on the soil, hence the great value of tile draining. But this is not all the value to be obtained, for a soil thus treated, like the loess, is nearly always ready for the plow, and thus in the condition to be planted early in the season—a point of great importance, as I propose to show in its proper place.

The question of drainage involves another one—of capital—a condition that most farmers might not find it convenient to comply with; and this brings us to the inquiry in regard to using more capital and

LESS LAND,

or rather to turn part of the land into active working capital, with the intention of doubling the crop per acre. All our lands may not be so largely benefitted by tile draining, but a large share of our clay loams, or heavy clay soils, as well as some of the sandy clays of the carboniferous limestones. The sand ridge that crosses the Illinois Central Railroad at Onarga is an example of this latter variety of soil, containing a large or greater percentage of sand than the loess, yet it holds water like a sponge, and can only be made available by either tile or surface draining.

Wherever the water can pass through the soil, the air can and will follow, and, as it supplies a large share of the elements of plant growth, is of the utmost importance to the crop.

In the soil, the tendency of water is in two directions—the one downward, by natural or artificial drainage, for the purpose of depositing ammonia and other gasses, and the other upward, by capillary attraction, to supply moisture for the elements of fertility. To enable water to perform this double duty, the soil must be finely comminuted, and not liable to pack or become tenacious. The passage of water and air downward through the soil has the effect to put it in condition for the ready penetration of the roots through its strata, and for the easy access of water from below by capillary attraction.

The old theory of composts has been rendered obsolete by this new science of draining, as it has been proved that when the water can pass through the soil the fertilizing elements are retained, unless the soil is very sandy or has not sufficient clay to absorb these gasses, and this has led to the new mode of applying manure by top-dressing.

On many of our soils

SURFACE DRAINING

by back-furrowing into seed beds, has proved useful in a general way and exceedingly valuable to this crop, not so much on account of aiding the fertility of the soil as to allow of early planting and prompt culture after a

heavy rain. These seed beds may be two to four rods in width, and ought to be laid out in the direction of the natural drainage, and in case of crossing a depression a cross drain should be made to lead off the water. Repeated plowings will raise these beds to any desired height, and thus keep the surface free of water and allow of easy and prompt culture. In a wet season this is of the first importance, for corn will make little or no growth while water is standing on the surface, while the weeds are not affected by the same cause and rob the crop of those elements so essential to its growth. When we must destroy weeds between showers or rainy days, the surface must be in a condition to dry quickly, or the next shower will be in the way of their destruction, and the crop will suffer by their continued growth. There is no further extra cost in farming these seed beds than the slight trouble of laying them off of a uniform width. Should the land be tile drained, the dead furrows already made will facilitate the operation, and, by reversing the plowing, the surface can easily be made to assume its original level.

We shall next consider

THE TIME OF PLANTING.

In Central Illinois, say on the line of 40 degrees of latitude, planting ranges over a period of sixty days, as the extremes, or from April 20th to June 20th. Plowing for the crop often precedes this by ten or twenty days. In all tenacious clays it is not desirable to plow when the ground is very wet, as it packs the soil, and thus, for the season, locks up its fertility.

In this early plowing it often occurs that the heavy spring rains so pack the soil that the surface will need a stirring with a cultivator to render planting possible, and to destroy the first crop of weeds.

As a general rule, our farmers prefer to plant from the first to the middle of May, and only from necessity plant outside of this time. Last spring a small amount was planted in April, all of which had to be replanted on account of rainy weather and the want of tile or surface draining. These heavy rainfalls occurred over the entire State, and active planting did not take place until the 18th of May, and continued until June 20th. That part of the crop planted as late as May 25th matured in about 125 days. Some of it was injured by the frost of September 17th and 18th. All of the later planted was more or less injured by frost. We may set down 120 to 125 days as the average period necessary to mature a crop of Dent corn, from the time of planting to its immunity from frost.

A warm arenacious soil, a free use of manure, and clean culture, will, of course, modify these figures to some extent; nor must we lose sight of the condition of drainage in this connection, for in a cold wet season it warms the soil, and thus hastens growth.

PLOWING AND PLANTING.

If we could follow up our daily plowing with the planter we should have less cause to complain of the want of a good stand; but this is not always obtainable, sometimes for the want of a corn-planter and sometimes for the

object of check-row planting. When it is necessary to plow a certain field, or part of it, before it is planted, it must then be marked one way and planted at right angles to this marking, by depositing the seed at the point where the lines cross each other. In this mode of planting the field can be worked both ways with the team, which is very desirable.

Several efforts have been made to construct a planter that would plant a land, or one of the seed-beds before described, as plowed, and at the same time check-row, but thus far the success has only been partial. So desirable is it to plant immediately after plowing, that many farmers plant their rows in one direction, sometimes in drills, but mostly in hills with the common planter. In this way the young plants have the start of the weeds, and will be ready to work at the close of planting the field, if it is of a size to require some days to complete the work. In this way no time is lost, the working follows the last planting, and the weeds are easily kept in check.

No one thinks of planting by hand, and the entire crop of the State may be said to be planted with automatic planters drawn by horse power, and planting ten to fifteen acres a day. The "Illinois Corn Planter," made at Galesburg, like the Moline Plow and Fairbank's Scales, is the standard of excellence by which all corn planters, plows and scales, in their several departments, are measured.

THE DEPTH OF PLOWING.

This depends much on the condition of soil in regard to moisture, porosity, color, drainage and mechanical texture. A heavy clay, like our timber ridges and dry prairie swells, should be plowed deep, say eight to ten inches. Without deep plowing on this class of soils the crop will be uncertain, while on clay loams shallow plowing, followed with thorough culture, will be found quite another thing. On sandy soils the depth of plowing is of even less importance, and the same rule holds good on all tile and surface drained lands, for the reasons before stated.

ROLLING.

There is nothing that has more distinctly marked the progress of corn culture than the general introduction of the roller. It serves to pulverize the soil and to render it more finely comminuted, adapting it for a supply of moisture by capillary attraction. It has also great advantages in insuring a good stand. If we plant deep when the soil is cold or wet, the seed is lost; if shallow, without rolling, and the weather becomes dry, with high wind, the seed will be liable to fail of germinating; but if planted shallow in a finely pulverized soil, closely packed on the seed, the warmth of the sun, however slight, brings it forward, and the drying winds will have little influence in retarding its germination, and we thus insure a good stand under almost all conditions of the weather. In case the soil is a little wet, so that it packs, however slightly, it is of great importance to have it pulverized and made friable. After the winter's frost ceases, the only remedy left is to accomplish this by mechanical means, and the roller offers the best facilities for this purpose.

CULTURE.

My time will not permit of going into all the minutia of culture, and I will therefore proceed to give in detail a system that is simple and well adapted to cheap lands and dear labor, not one that will produce the greatest possible yield, but one that will make good returns for the capital and labor employed.

I will take it for granted that the soil is well drained, either naturally or by raised seed-beds, as previously described. The plowing and planting to go hand in hand; the roller to precede the planter; two or three days after planting to be harrowed and again rolled. The object of this operation is twofold—to comminute the soil and to pack the surface closely on the seed, so as to hold the moisture necessary to its germination. It is also desirable as enabling us to cultivate at an earlier stage of its growth.

We may then follow up the culture weekly, or as often as desirable, until the period of laying by the crop.

WILD UNBROKEN PRAIRIE

that has been pastured for some years, when broken up to the depth of six to eight inches at the proper time for planting, is found to be among the most valuable and certain of a crop, giving a better yield than the old lands. This suggests the propriety of a rotation of crops with the meadow and pasture.

We might give some figures of the cost of cultivating forty acres in the mode we suggested:

To plowing forty acres eight inches deep, one and a half acres per day, at three dollars per day	$80 00
Rolling, three days	9 00
Planting, three days, including use of the planter	12 00
Harrowing, four days	12 00
Rolling, three days	9 00
Working with two-horse cultivator, four times, twenty days	60 00
Husking and cribbing 2,400 bushels corn at seven cents	168 00
Five bushels seed	5 00
Total cost	$355 00
Cost per acre	8 87
Cost per bushel	10⅝

If we allow one-third for the rent of the land, as is the custom, we have the corn delivered in the crib at 22 18-100 cents per bushel to the tenant, while the owner of the land has twenty bushels to the acre for the use of his land, which, at fifty cents a bushel, gives him ten dollars an acre as rent. I do not suppose that any person conversant with corn culture in this State, will consider this estimate above the average yield under such a system of culture.

MANURES AND HOEING.

As a general thing manures are not applied to the corn crop in this State, but in every trial it has been found profitable.

No one thinks of going into our large fields with a hoe, but the price of land may advance so as to make this an object, with a view to increase the yield per acre.

I have but lightly sketched a few of the more prominent features regarding this great staple that has given to the State a large share of her material prosperity, that has placed her in the front rank of the states of the Union, and the central commercial power in the Northwest, and that will continue her in her onward progress.

DISCUSSION.

Mr. FREEMAN—One year ago last fall I had occasion to stop and feed my horse, and I noticed that the man had red corn in his crib. On inquiry, I found that he raised red corn exclusively. He had grown this variety for many years. His reason for it was, this corn yielded more per acre—100 to 110 bushels, by weight. It was admitted that he was ahead in corn growing of his neighbors, and that he was ahead 30 years ago. My father raised 100 bushels to the acre, but he did it by putting on bone dust.

But what I wish to speak of more particularly is of the varieties of corn in selecting for seed. I saw in some paper the statement of the fact that a chemical analysis of the common white corn and the Tuscarora showed that the white corn had double the amount of phosphates that was contained in the other. Now this being the case, it is important to observe the fact (if it is a fact) in making our selection, and to take that which will exhaust the soil least, providing we get equal weight in corn. I have an impression that an analysis of corn of different colors might indicate that we should get this man's red corn. The color of corn, if it is sound, does not seem to affect the price of it very much. Last year, having occasion to buy seed corn, I went to my neighbors to get it, and found that they had colored corn. I got some of it and planted it, and it was very curious to note that the horses and mules would take to it more readily than to the white corn. (Here various samples of corn were shown by the speaker.) The corn generally grown in this region is, I believe, of the Dent variety.

The gentleman says one way to increase the crop is by improved culture; I think another way is by studying the varieties and learning what variety will produce the greatest weight with a given amount of labor.

Dr. MORSE—My friend Mr. Dunlap took me to task for some statements that I made, for which I am very much obliged to him. I wish now to pay him off in his own corn. [Laughter.] He says that the corn in Southern Illinois is wanting in nutrition, as compared with corn grown further north, because it lacks a full proportion of starch. Now I say all corn grown south has more starch than corn grown in the north, and for that reason is lacking in nutritive qualities. Because starch makes a man's collar stiff it does not follow that it stiffens his back bone. [Laughter.] In regard to the nutritive value of different varieties of corn, we think the New Jersey corn the best. This corn should not be fed whole but ground.

Mr. DUNLAP—I am very happy to give the Doctor an opportunity to return the compliment, and I only regret that he did not take advantage of it. It is a fact that when we come to look upon the corn of Central Illinois we find a corn that will make perfect whisky, and is food for everybody—the like is not grown in the south. Doctor, anything more?

Dr. MORSE—I believe you have not told us whether it is profitable to grow corn for fuel.

Mr. DUNLAP—That shows the ignorance of the people of the East, who still think that we out here breakfast on young Indians cooked! Why, we have seven feet of coal; we don't need to grow corn for fuel; we have something better.

One other point. No food is more nutritious than corn, for the reason it contains the phosphates in large proportion. It is solid food, and can be used three times each day. I regret that it has not been introduced universally as an article of food for man.

Mr. ROBINSON—Ordinarily the white corn is worth ten cents per bushel more than yellow corn. Still-houses make no difference in the price. The glutin is equal in the two varieties, but the oil and the starch is different. I think that stock do better on yellow corn.

That idea of burning corn is not so ridiculous after all. I have seen corn used for fuel. When corn is only eight and ten cents per bushel it does not pay to take it to market, and would not pay

for digging up the coal. And about eating young "Injuns." We do eat Indians, but it is in the form of Indian corn. [Laughter.]

Prof. STEWART—It seems to me that gentlemen labor under a slight mistake in reference to the origin of whisky. It comes from the starch of corn. The starch is converted into sugar, and the sugar into alcohol. That corn which contains the most starch is the best for the distiller. Hence white corn, having more starch, is the most valuable for his purpose.

Mr. ROBINSON—Distillers make no difference in the price they pay. The starch manufacturers will give eight cents more for the white than for the yellow.

Mr. DUNLAP—This is because of its whiteness.

Mr. ROBINSON—They make no difference in the price. There is Missouri corn, with ears eight feet from the ground, but the Illinois River corn brings the highest price in the Chicago market. I think there is no reason for it, except that it goes by canal, and gets into market in better order.

Prof. STEWART—What varieties of sweet corn, for table use, do you recommend?

Mr. DUNLAP—There is one variety called early sweet corn. This is the best for the first planting. Then comes three or four other varieties; among them, Stowel's Evergreen, which has long ears, and is, perhaps, the best.

Prof. STEWART—I have not had success, as a general thing, in raising sweet corn and having it early. I have raised King Phillip corn and had it for use by the first of July. It may be bitten off by the frost to the top of the ground a dozen times, and it will still come, and we will have it by the first of July. We plant it in March, say about the 20th or 25th, planting about half an inch deep. I remember on one occasion planting corn in my garden—only five rows. This brought me $16. A few days later corn was not worth anything, comparatively. I have been in the habit of raising it for my pigs. I sent East for ten bushels of it, planted in July, which hardened up before frost.

Mr. DUNLAP—The Tuscarora corn is grown in the place of sweet corn.

Mr. PERIAM—My practice has been to plant very early. I should prefer to plant King Phillip corn in March rather than the first week in April; for we know that corn will sometimes grow planted in the fall, when planted in April it will not grow. The

Burlington corn ripens in 85 days. It is the earliest corn I know anything about. I would advise the planting only of the extra early kinds, and plant these *very early* in the season, about the time of sowing oats.

Dr. MORSE—I recently traveled East, and found the people growing corn for the purpose of canning. Now it seemed to me that this was a good thing for western farmers to go into. I said to one man, "I should think western men would go into this," but he replied, "they can't do it."

I remember, also, visiting a cheese manufactory. "Well," said the gentleman showing me around, "one thing you can't do out West, you can't compete with us in making cheese." I replied, "we can beat you all to pieces." "You have no springs," he retorted. "There is a man," I said, "who has invented a milk-cooler, and we don't need your springs." Eastern men try to convince us that we can't do what they can.

Prof. STEWART—I never saw any corn that was canned fit to eat.

Mr. FREEMAN—It is a very simple operation. I will give an illustration. I put up a dozen cans one season. I was assisting my wife in putting up the corn. We were going out that day, and were in a hurry to complete the work, and did not give the corn time to boil. It was soldered up cold and set away. A small hole was punctured in each can, and they were boiled the next morning, and every can of them kept perfectly, and all who ate of the corn said it was fresh and good as when cut from the cob.

A VOICE—Is there any danger of the steam bursting the can?

Mr. FREEMAN—No, sir; not at all.

A VOICE—How long do you boil it?

Dr. HULL—Four hours is the time.

Mr. FREEMAN—From observations made in the southern part of the State, we gather the following interesting facts: In the elevated regions about Cobden we must plant early, but 30 miles south of there, on a fine bed of loess, they plant corn on the first of July and make fine crops. They are there about sixty feet above water-marks. Cobden is 500 or 600 feet above.

Mr. DUNLAP suggested that it would perhaps be easier and safer to grow corn and *dry* it, instead of canning, a process not always successful in all hands.

DR. WARDER ON THE PLANT.

What is a plant? The question appears to be a very simple one, and one which almost every one feels himself capable of answering. And yet learned men are puzzled to answer it.

A plant is certainly different from an animal. It is different from a stone. We might perhaps be tempted to rank it between an animal and a stone. But we observe that it has an organized being. Linneus gives this definition: Animals live, grow and feed; plants live and grow, but do not feed. But stones neither live, grow nor feed. Stones, we say, do not grow. They increase in size by accession, or accretion. By additions of rocks on rocks, they increase in size.

Now this definition, considered satisfactory, is not so satisfactory, after all, when we come to examine the lower orders of animal life, and the highest orders of plant life. We have animals that do not move, the oyster for example. We have plants that, while we cannot say they see or feel, yet they seem to be exceedingly sensitive. We have a plant called the "sensitive plant," which is an example and good ilustration of what I say. If you approach it it seems to be aware of your presence, and its words are "touch me not."

In the study of the general attributes of plants, we are scarcely able to separate them from animals by any absolute character. Animals are, for the most part, incapable of multiplying by mechanical or spontaneous subdivision of their trunks, and are supported by nutritious matter carried into their system by an internal bag or stomach. Plants are, for the most part, a congeries of individuals, multiplying by an artificial division of their trunks or axes, and supported by nutritious matter conveyed into their systems by the absorption of their outer surface, chiefly by their roots. Generally speaking, plants are fixed to some substance, from which they grow, are destitute of locomotion, are able to digest their food by the action of light upon their skin, and form starch at some period of their lives.

Animals, on the contrary, seem never to form starch. In the simplest animals and in the simplest plants are vesicles, or vesicular threads, the most complex of which may be regarded as indefinite multiples of such vesicles, arranged in definite forms. These are composed of tissues, out of which elementary organs are constructed. Tissue, when first formed, consists of a substance called cellulose: carbon 24, hydrogen 20, and oxygen 10. That is in its simple form, but its chemical nature is rapidly altered by other matters, and especially by an increase of the relative proportion of carbon.

There is another remarkable property of tissue. It is a hygrometrical substance, possessing adhesiveness, elasticity, extensibility, irritability and vitality.

Its adhesiveness enables the elementary organs to grow and adhere to one another when in contact. Its elasticity permits the tissue to bend and recover its position—to stretch and contract itself. The former property is essential to plants, in consequence of their exposure to the disturbances of

the atmosphere, from which their want of locomotion prevents their escape. The latter is demanded by the emptying and filling processes, which are incessantly in action in the elementary organs while growing. Its extensibility enables it to enlarge as new matter is added to it, and to take in the fluids and gases received from without. Its irritability renders it susceptible of the influences of light, heat and other external forces. Its hygrometrical quality causes it to absorb water greedily when presented to it, a quality or condition that is essential to vegetable life. The next property I will name is that of vitality. This keeps all the other qualities in play, enables plants to digest and assimilate their food, and their various organs to perform their manifold functions.

Now there is another property to be named. The various forms are held together by an organic substance called *mucus*, out of which the tissue is generated. This is called intercellular substance, or *cambrum*, when exuded on the parts of an already organized plant.

Tissue appears in various forms. In the form of cellular tissue—the woody fibers, the vascular form; the pitted and the laticiferous forms, variously modified—constituting the elementary organs. We now come to consider these elementary organs, and first, cellular tissue. We have endeavored to give a representation upon the blackboard of cellular tissue. This is the only elementary organ found in plants. It is composed of vesicles. Each vesicle is a distinct individual, cohering to its neighbor. When separated they are round or oblong. When compressed slightly they assume another shape—hexagonal. When stretched they are prismatic, cylindrical, fusiform. We have here on the board what was intended to represent cylindrical cells. The whole may be considered as a cylinder. There is a representation also on the blackboard of what we call pitted tissue.

Woody tissue is made up of long cells, tapering to the ends, closely compacting the plant together. The growth of cells consists in the deposit of matter in these thin tissue formations. That they are cells is seen when immensely magnified by the microscope. We see it in cotton. In cotton the cell is elongated. [Here the lecturer illustrated the formation of cells in cotton on the blackboard.]

If any of you have ever been stung with a nettle you have experienced the power of a single cell of that plant. [Explained upon the blackboard.] It is the poison of one cell only that escapes and enter syour body. [Vascular tissues and spiral vessels were explained on the blackboard.]

The anatomy of plants was studied long before the true physiology of plants was understood. In the earlier investigation of this subject it was supposed that these cells were air vessels. These vessels do perform important functions. They offer a subject for investigation full of interest, but it is almost impossible to illustrate and explain this subject without recourse to the microscope.

I have spoken of the growth of cells by the deposits laid upon them. This was further illustrated on the blackboard. To the question, "how do plants get anything to eat and drink, and thereby develop growth?" it was answered, they can grow only by absorption from that which is without.

On the subject of the development of cells and the growth of plants, the following was given as the contents of proloplasm—the vital vegetable substance:

Amyloid-jelly, starch, chlorophyl, chromule, wax, oil, camphor, resin chrystals or raphides, sugar, gum, dextrine, tannin, caoutchouc and alkaloids.

We cannot dwell much longer upon this part of the subject.

One of the first things or parts of plants that will attract our attention is the outside—the outer skin, called epidermis. At points in the epidermis there are openings which open and shut at the will of the plant—some plants at least seem to have life. These serve as *stomates*, or little mouths of plants, through which they take their food by absorption. The epidermis, stomates and hairs were given as simple organs.

I wish now to say a few words about compound organs—the axis and its appendages, formed from a spore, an embryo, a leaf bud, by the development of a root in one direction and a stem in the opposite direction. This root downward and stem upward is the first thing that strikes us in the development of a plant. I have here on paper a picture of an ideal plant, showing the seed, the axis ascending and descending. We will explain these terms, spore, embryo and leaf bud. A spore is a young plant, produced in the interior of another without the agency of the sexes, and having no determinate points of growth.

An embryo is a young plant, produced by the agency of the sexes, developed with a seed, and having determinate points of growth. Take a Lima bean and soak it, and you can see the embryo.

A leaf bud is a young plant, produced without the agency of the sexes, inclosed within rudimentary leaves called scales, and developed on the outside of a stem.

A spore, or an embryo (seed) propagates the species; a leaf bud propagates the individual.

When excited the tissue develops in three directions: downward, the descending axis or root; upward, the ascending axis or stem; horizontally, the medullary system. Every part which grows from this axis in a symmetrical manner is an appendage; the leaf is the type of all. The stem is always produced by the successive development of leaf buds. In proof of this we state the fact that if you carefully extract the bud from the axil of every leaf the stem will not increase in size. If you make a notch below the leaf bud it will not increase in size. You may tie a string tightly around the stem and parts below will not increase, but parts above will increase in size remarkably. We saw this beautifully illustrated at Bunker Hill, in the orchard, I believe, of our friend Mr. Jon. Higgins. The sap could flow from the root and stem upward through the wood, but could not return through the inner bark below the bandage.

The diameter of exogenous trees, that is trees that increase by accretion on the outside, increase in proportion to the number of leaf buds. But there is another class of trees called endogens—those which increase from within—inside growers. [Explained by reference to diagram on the board.]

A word in regard to the leaves, which are the appendages of plants. Before the leaves appear the seed lobes perform the functions of the leaves. By-and-by the leaves appear, becoming more complex as they ascend the stem, with various arrangements and modifications. Finally appears the flower, embracing the seed buds and becoming the seed leaves! a plant, perfect in all its parts.

Now you see that buds are little plants, seeds are little plants, embryos are little plants.

We have these two methods of propagating: If we propagate by seed we propagate species. If we propagate by buds we get individuals. Occasionally a bud will "spurt," but, as a rule, you may plant a bud with perfect certainty that you will have a result like the tree from which the bud was taken.

DR. WARDER'S LECTURE ON THE NECESSITIES OF PLANT LIFE.

In attempting to portray the world of teeming nature, as it has been spread before us by the Creator, the poet philosopher, the celebrated Goethe, makes Faust say "A thousand germs come struggling forth in drought and damp, in heat and cold." And yet, under these most opposite conditions, each germ appears to be perfectly satisfied with its surroundings, different as they are. The fact is that various plants require just these opposite conditions for their development.

The protococcus, which delights in the snow and ice of the northern polar circle, could no more exist in a heated atmosphere than could tropical plants if removed to our latitude. Wisely and well it has been arranged by Him who doeth all things well, that each portion of our globe where plant life is at all possible shall have its own peculiar flora and fauna, so that wherever life is practical, some beings shall be found to enjoy it. Hence, also, the charming diversity of organized beings; and by the aid of Geology, with its adamantine records, we find that such has been the case ever in all ages of the world's history, only that the conditions of many portions of the globe must have been entirely different, as to heat and moisture, at certain epochs, such as those at the coal formation from those with which we are familiar in our own times. Even in the latter portions of the quaternary period, perhaps just before the historic era, when man was introduced upon the earth, these broad and undulating prairies that surround us were vast pools of shallow water, filled with confervæ, that could subsist only under such conditions of moisture and temperature as then existed. Though no human eye was here to watch their progress, to study their mode of growth, to examine with the microscope the curious changes going on among their cells, the all-seeing eye of Omnipotence was superintending and directing the process of growth, development and decay that was preparing for us the fine rich prairie mould from which we are now deriving our sustenance, and from the productiveness of which you are enabled to feed the world.

To sustain them plants must have food. But what constitutes that food? You were told by Prof. Stewart, in his excellent lecture, of all the different

chemical elements that are found in vegetables; these, therefore, must have existed in the food of the several plants, but you will recollect he informed us that of these elements four only constituted the chief bulk of plants—carbon, hydrogen, oxygen and nitrogen. These, then, are the chief or most important parts of plant food, though some of the others are equally essential to the healthy growth of a plant, even though they be taken in smaller proportions.

Do the plants need these elements in a free or in a combined state? This we do not know, but the inference is that they are taken only in a state of combination, except oxygen, which is diluted in the atmosphere, held in suspension and mingled with nitrogen rather than chemically combined with it. Water and air are the great means of presenting and bringing food to the plants, and it is probable that water is essential to the digestion of the food, to the production of the fluids and to their passage through the organisms. So what we call crude sap is really a weak solution of substances that are taken into the circulation, carried up along the so-called air vessels of the alburnum, and diffused through the organism, variously modified by and producing various modifications upon the materials it meets in its progress of cell circulation. The compounds thus taken into the tissues of the plant are resolved into their elements, or rather they are transformed into other compounds by the curious and hidden processes of the vegetable laboratory. We must not forget, however, that the functions of the leaves are not simply to act as exhalents, throwing off the surplus watery fluids by evaporation, but they are also absorbents, drawing in from the atmosphere carbonic acid, from which, under the influence of sunlight, they retain the base and throw off the oxygen.

But to return to our topic. Let us consider the necessities of the embryo, the seed which we intrust to the tender mercies of the earth. It has within its own organization the elements of its future growth, but in very limited amounts. It can create nothing, and if the resulting organism increases in weight, as we know it does, and with great rapidity, let us inquire what are the conditions that will favor this development, and what the materials to be added.

As a rule we desire to exclude the light, hence we cover the seed with the soil, and here, practically, we must observe that this covering should not be too great, and that the smaller the seed the less the covering should be. Next our seed needs moisture, and the soil will furnish this in the right proportions, to be absorbed through its teguments, that willingly receive it, sooner or more slowly, according to its physical condition. Sometimes this is very slowly indeed, with seeds that are invested with a horny or woody covering. The air must have access to the seed, and this is always present in sufficient quantities in well prepared and properly comminuted soil, though excluded by an excess of water, as sometimes occurs after heavy rains. This air is needed for the sake of its oxygen, which is the great vivifying principle or element.

Carbonic acid is also at hand, held safely in store by the humus of the soil, but ready to be transferred to the radicles so soon as they are formed, if in-

deed it be not taken into the germinating seed itself. Ammonia, or its carbonate, is also held in the same manner by the soil, which is the great disinfectant of the atmosphere, as well as the filterer of the rains which wash the ammonia from the air in every shower. Nitric acid, and perhaps sulphuric acid, is also washed from the air by the same means and left in the soil.

Here then we have a rich banquet spread out for the young embryo that is to be developed from the seed into the coming plant. Its necessities are all supplied—light, heat, moisture, air and appropriate food. Thus we have considered the necessities of the plant, which is to be produced from a seed, but it has been shown that the bud plant is only another form of the development of the seed and its embryo, or rather, we should say, that the seed embryo is only another form of the leaf bud, modified by the morphological action of the plant—apparently changed—certainly different in its characters, and capable of undergoing a longer separation from its parent stock, capable of being transported to a greater distance, and also capable of producing a new variety, somewhat different from its parent.

We should therefore consider the necessities of the plant in this form, also—the bud. For we may as well consider each of these organizations, henceforward, as a distinct plant, rather than as a part only of a plant. So long as it retains its connection with its parental organization it needs only such treatment as is bestowed upon its parent. There it may remain for a long time dormant, even until the destruction of the entire plant, the complex organization with which it is connected, or, as is usually the case, it may develop into an axis of growth with its necessary appendages, and produce more buds, or even modified buds—seeds.

But when separated its necessities will be somewhat different. It has already been demonstrated—and you may verify this at your leisure by making longitudinal section of any large terminal bud, as that of a lilac—it has already been demonstrated that a bud has an axis of growth, just like the stem of a plant, though shorter, but it also has leaves, the scales, as they are called, which invest it closely and serve as a protection from the elements. And these are evaporating surfaces, that would soon exhaust the plant of its moisture, therefore the bud cannot be safely exposed, like the seed, but requires sooner to be placed in conditions more favorable to its preservation. These are, that when separated, as in any of the methods practiced in propagation, it should be placed in a confined atmosphere in contact with the soil, if possible, with a sufficient but not excessive amount of moisture, and with the proper degree of heat and a diminished amount of light.

It must not be overlooked, however, that these bud plants may be safely transferred from one plant to another, under favorable circumstances, and that they may be made to grow in their new situation, not directly in contact with the soil, and only connected mediately with it, as in budding and grafting. It is better, however, to consider first the necessities of our bud plant when placed in immediate contact with the soil itself. Bear in mind that our bud has already the organs necessary to constitute a plant, to-wit: the stem and the leaves. The former may be very short, the latter very rudimentary. In this case we need almost the same conditions as with the seed, only that

as we desire to extend the axis or stem downward to form the roots, we need to encourage the development of cell growth, for the formation of a callus and roots, before we excite the development of the ascending axis or stem, with its leaves and appendages, because we must seek to supply additional moisture to keep up the waste by evaporation that would occur if the leaves were developed first. To effect this we encourage the cell growth of the base of the bud or short cutting, until, by the accumulation of new cells, a callus is formed, from which, by a further development of cells, arranged in a continuous line, rootlets are formed to absorb nourishment from without, just as occurred in the seed by direct absorption of water through its tissues, before the development of the embryo into the plantlet, with its radicles and plumule.

The bud cutting is then ready to have its upward growth developed, and this should now be encouraged. All this is perfectly under our control, and it depends upon the amount of heat and the mode of applying it. This stimulant should be withheld from the upper portion and increased at the lower. In the language of the gardener, we should apply "bottom heat," keeping the soil a few degrees warmer than the air, until the rootlets are formed, and then applying it to the surface to stimulate the development of the bud and encourage its upward growth.

DISCUSSION.

Mr. DUNLAP—With your permission, Mr. President, I would like to ask the Doctor one question. In relation to the growth of plants or trees, we observe that all do not grow in the same manner. What terms do you use in describing these different forms of growth?

Dr. WARDER—I will answer, there are outside growers and inside growers. The one is called *exogens* and the other *endogens*. We have on the board a representation of outside growers. The rings indicate the amount of increase in the several seasons.

Mr. DUNLAP—Now I can make up my notes.

Dr. WARDER—I hope your notes will be complete. [Laughter.] One word in regard to taking notes. I do not think it is advisable for the students to take extensive notes upon this subject. Do not attempt to take down notes verbatim. Seize upon the point presented, and endeavor to retain it. Jot down a word here and there, to aid the memory, and fill out your notes, if you wish, in your room. But endeavor to get the idea.

Dr. GREGORY—I am glad that Dr. Warder has mentioned this subject. It is a matter of importance that you give your undivided attention to the subjects presented in the lecture. It is es-

sential that you hear. Get the thing that is said, and get *everything* that is said. Never attempt to write out the whole sentence. I would suggest also, with Dr. Warder's permission, that the young gentlemen take occasion to read up on the subjects presented from time to time in these lectures. You will find that it will help you to understand and profit by these lectures, as you would not otherwise be able to do.

Dr. WARDER, in answer to a question about the failure of cuttings to grow, said: You will probably find, on pulling up the cutting, that it had not even formed a callus. The plant did not have force enough to develop itself and produce roots, and for the reason it was not placed in a condition favorable to such development. If the cutting had been placed in a position favorable to the growth of roots, then when the upper bud starts into growth the leaves would bring up the juices from the soil, through the roots, and secure the life of the plant. Plants die simply because they have used up the nourishment provided for them. There is only a definite amount of food in the cutting, and when this is exhausted, without further supply, there is nothing to do but to die.

Dr. GREGORY—You stated, Doctor, that your opinion was that heat was simply a stimulant. What is meant by heat stimulating plants? What is this stimulant?

Dr. WARDER—We know that when plants are allowed to grow in a dark place—the potato growing in the cellar is a good example—they are deficient in the qualities that belong to a healthy plant. But let a ray of sunshine and heat strike it, and how soon a change is made. There is stimulus—what we call stimulus. This develops increased action, and the result is the elimination of oxygen, thrown off in the air by the leaves. You have seen the long, slender, watery stalks of the potato growing in a dark cellar. They have no color, because it requires the action of light to produce the coloring matter. Plants fully exposed to sun and air have the chlorophyl, those not exposed have it not. The stimulus of light in the growth of plants is essential to their healthy development.

Mr. FREEMAN—Can electricity be regarded in any other aspect than that of heat?

Dr. WARDER—Perhaps not.

Dr. HULL stated that he had a different way of putting this matter. He explained that plants derive much of their sustenance

from the ground, and that they die because, being placed in unfavorable conditions in this respect, the supply of food is cut off. He started the question as to whether manure was not food for plants.

Mr. DUNLAP—I am glad, Mr. President, that this matter of manures is to be settled here. I understand the Doctor to take the position that manures are food of plants.

Dr. WARDER—I consider all manures food for plants, but I prefer my own language.

Mr. DUNLAP—It is a question whether manures are food for plants directly, or indirectly by rendering the conditions favorable for the plants to obtain food from other sources, and I want to have the question settled now.

Dr. WARDER—I do not think we can settle it. That manure acts as food for plants, either directly or indirectly, is my conviction, and what I wish to say is, that which in its crude state is a nuisance, may be composted into most valuable food for plants. He spoke of clay as being a good absorbent, and of earth-closets as being the most efficient and economical way of saving and deodorizing human excrement.

Mr. DUNLAP—It strikes me that this is a subject that has been overlooked in this course of lectures, and I am glad that our attention has been called to it. There can be no doubt that portions of manure are plant food, but its great service is as *holders* of valuable gases known to be food for plants.

WHEAT.

A LECTURE BY W. C. FLAGG, OF ALTON.

The semi-tropical summer of the Mississippi Valley points to corn as the most natural and valuable grain that can be grown within our borders. But wheat, from its easy culture, its ready sale, and its universal and acceptable use, even upon soils and under skies not at all propitious to its growth, is second only in importance. We even find wheat grown where corn is the more profitable crop; something which I can only account for on the supposition that the quick returns of the wheat crop are an irresistible temptation to the thriftless farmer.

In Southern Illinois I find, upon fair calculation, that the cost and value of an acre of good corn and wheat are about as follows:

	Corn.	Wheat.
Plowing	$1 50	$2 00
Harrowing	20	20
Laying off	20	....
Planting	25	20
Seed	25	2 50
Tending	80	....
Gathering	2 50	....
Cutting	....	1 00
Binding	....	1 25
Stacking	....	1 10
Shelling	2 40	....
Threshing	....	2 40
Hauling	1 80	60
Total	$9 90	$11 25
Product estimated	60 bushels.	20 bushels.
Price	75	2 00
Gross value per acre	45 00	40 00
Net value per acre	35 10	28 75

This makes an excess of $6 35 per acre in favor of corn, supposing it is shelled and sold in the market. Fed on the farm, it could of course be made much more profitable. In that case profits from feeding could be added, and the manure of the stock to which it was fed would go to enrich the land and prevent the exhaustion of the soil.

In face of such facts as the above, I believe that, in certain counties of our State, wheat growing has steadily increased, while corn barely holds its own. In Jersey, St. Clair, Monroe, Randolph and Clinton counties, lying near St. Louis, the acreage of wheat, according to the Auditor's report just rendered, exceeds that of corn. In Monroe county three acres of wheat are grown to one of corn. St. Clair has nearly two acres of wheat to one of corn, and Jersey about three to two. Other counties are following in their wake, and even Boone and McHenry, on the north line of the State, give more spring wheat than corn. No cattle worth mentioning are kept on these wheat farms. The straw is burned in the field, and the only return, if we may call it such, made to the soil, is generally a clover crop turned under, and, in a few instances, a scanty manuring from the stables of the horses kept to plow the land. In some cases no corn is grown on the farm, but is purchased with the proceeds of the wheat crops.

The wheat grower therefore must look about him and seek better methods, or he will rightfully be accused of bad economy. He may hardly be able to show that, even with the best management, he can make wheat replace corn in profit in the State of Illinois; but as part of a rotation, as one of a succession of crops to fill the year with labor and harvests, he may be able to show that it has a fitting place and a profitable use, whilst its excellence as a bread stuff renders it almost indispensable.

Premising thus much by way of protest against the terrible waste of agricultural wealth now going on all over the West, by growing and exporting

this valuable grain, and robbing posterity without real benefit to even our own generation, I will undertake to say, in the want of a fit person, a few words on wheat growing.

In Illinois, according to the State Auditor's last report, we had, in 1867, 2,083,189 acres in wheat, against 4,725,386 acres in corn. Of this two millions of acres, probably somewhere about half was winter wheat, mostly grown in the southern part of the State, and the other part spring wheat, generally grown in the northern portion. The spring wheat seems best suited to the cooler springs of the northern portion, although I have known instances of thirty bushels to the acre as far south as Alton. The winter wheat, owing to the snowless winters on our plains and the looser character of the black soils, is more easily winter-killed in the central and northern part of the State, and is limited to the white soils of Southern Illinois for its most fitting place and successful growth.

The best soil for winter wheat, so far as I have observed, are the white oak ridges along the Mississippi bluff. The crop is there quite certain, and the quality of the grain and the flour made of it quite superior. The poorest soils for wheat are the wet and rich prairie lands of the creek and river bottoms. I suppose the wheat of Jersey, Madison, St. Clair, Monroe and Randolph counties, is about the best in the State, and is, no doubt, one reason of the crop having been so excessively grown in that part of the State. The hot climate of the southern part of the State, while I think it reduces the average yield per acre, probably has an effect similar to that of Southern Europe in producing a harder wheat, containing more gluten and producing a finer quality of flour.

The best rotation of crops in which wheat makes a part of the course, is, I think, the following, commencing with corn on sward:

First year year, corn.
Second year, corn.
Third year, oats, barley, or other spring crops.
Fourth year, wheat.
Fifth to seventh year, grass, as meadow.
Eighth to tenth year, grass, as pasture.

Thus for every year we have for every acre of wheat two of corn, one of oats, or other spring crop, three of meadow, and three of pasture. I am not prepared to say that this is the best possible rotation, but I think it is a good one, especially in its proportions of grass and grain.

Wheat, therefore, succeeds oats or other spring crop. It is a good succession to clover plowed under, and propably also to ordinary sward when pretty well rotted; but as a matter of convenience I prefer the above rotation, and let the stronger and ranker condition of green or other manures spend its first force on corn, while the wheat draws more from the better decomposed material and the original elements of the soil.

The stubble of oats should be turned under as soon as possible after cutting, in our climate, to a greater or less depth, which should vary according to the fertility of the soil and the weight of stubble. The poorer the soil, the deeper it should be broken up. The practice varies between breaking up

once in this manner and running a cultivator or harrow over the surface occasionally, to keep down weeds until sowing time, and plowing a second time just before seeding. All agree, however, in saying that the ground should be finely pulverized first, and then well packed together by rolling, or some other treatment, so that when the drill is brought into requisition it may find a hard, firm, fine soil to receive its flukes.

I say the drill, because all our experience in Southern Illinois, so far as I know, is strongly in favor of drilling in preference to sowing wheat. The drill saves seed, deposits it at pretty uniform depth, and leaves the plant sheltered in a shallow furrow by the adjacent ridges, whence the disintegration of winter's frost and thaws covers the roots instead of laying them bare. In the Michigan woods, where snow lies throughout the winter, I find drills in less universal favor.

Why wheat succeeds best when drilled in a hard soil, is, I take it, from the fact that such a soil heaves less readily, and does not admit frost to the roots so easily. This probably is one reason also of the superior success of winter wheat in the silty soils of Southern Illinois. The soil is there finely comminuted and comparatively free from vegetable matter, whilst here it is coarser, more friable and loose.

Owing to the ravages of the fly, farmers with us are now practicing later sowing than formerly. In avoiding this evil, however, it is a question whether we do not fall upon a greater. This late sowing necessitates the sowing of early ripening varieties, which are not the most productive, endangers the plant in winter from insufficient rooting, and delays ripening in summer, with consequent danger from heat and rust. The past season extreme heat, by its direct action, very materially lessened the yield per acre in our part of the State. But the rust is the disease most dreaded by our cultivators. This may be regarded as the result of extremes of heat and cold, drouth and moisture, whereby the vitality of the plant is lowered, and its tissues ruptured and made the prey of fungoid growths.

The culture of wheat has been rarely attempted in this country, although Jethro Tull and his Horse Hoe Husbandry were introduced by William Cobbett to American farmers over half a century ago. One gentleman who is present with us to-day, and who will, I hope, give his experience in the discussion, has told me that he fears spring cultivation because it increases the plant growth and delays too much the period of ripening, and endangers rust. Others, however, claim that harrowing in spring has been attended with a great increase of crop; and the drill itself suggests a use of that or a similar instrument to cultivate the ground between the rows of wheat.

This danger of late ripening, resulting from late sowing and spring cultivation, suggests renewed attention to the subject of early sowing. It ought, if possible, to be effected; and I trust Dr. Walsh and his co-laborers may sometime help us to it. Failing in that, we need to know more of those fungoid growths attending rust, potato rot, and the many diseases so fatal to the farmer and fruit grower. Here we feel the necessity of a State Botanist and Botanical Survey, which shall, among other things, develop and make

understood the various rots, rusts and mildews resulting from the changes of our variable climate.

The time of cutting wheat is a point upon which I have little personal knowledge, but which is a matter of great importance. It is a very common opinion that early cutting produces a plumper grain, a larger product, and a better flour. This opinion, however, is probably not correct, or at least only in part. During the past very hot and dry harvest, early cutting was, in one case that came under my observation, attended by absolute injury.

The methods of cutting, within the memory of many who hear me, have wonderfully changed and improved. First came the sickle. Not much before 1830 the grain cradle came into use in our State; ten or fifteen years later came the reapers and harvesters, the clash of whose shuttle-moving sickle bars are now heard upon all our broad prairies. These, like the "mighty night" of Euripides, brought comparative "repose to over-burdened men," but gave a new and probably excessive impulse to the growing of small grains.

Of reapers I have used only Hussy's, a heavy implement, only endurable when we had no better, and John H. Manny's, which I liked well. But I learn from others that Marsh's harvester and reaper, which carries two men upon it, who do the binding, is in many places doing excellently well. There are, however, a large class of reapers, all doing good work, and varying only in unimportant details, among which there is little choice.

Harvesters or Headers—so far as I have observed, I have no experience—are generally objectionable. First, because of the risk of waiting until the grain is dead ripe, resulting often in great loss from storms, and the "shattering" of the grain, and, secondly, from the difficulty of properly stacking and saving the grain in the present want of proper buildings.

The best method of taking care of the grain before threshing, unless threshing is done in the field—and this is a very wasteful process—is, in my opinion, putting it into open barns, thus securing good ventilation, and avoiding the common evil of waste from bad stacking and heavy rains. In England, with a very humid atmosphere and no violent rains, stacking is preferred, as keeping the grain in better condition; and stacking and thatching of stacks is there done with great thoroughness. In our usually dry climate wheat can remain in barns uninjured, whilst our occasional violent rains will penetrate almost any stack. By housing wheat early, moreover, we get a clean straw, which can be very advantageously used in farm economy, as feed, litter, etc.

Threshing grain is the least satisfactory of our improved processes. The old days of the flail, and tramping out with horses, are almost preferable to the present state of things. Threshing the present year, in several places in my neighborhood, has cost from 18 to 25 cents per bushel, or from one-third to one-half of the entire cost of production, which is 50 to 60 cents per bushel. A man with a flail could do as well as that, and probably more cheaply and better.

Of varieties, red and white May are generally preferred with us.

DISCUSSION.

Mr. FLAGG—I would like to call upon Mr. Fangenroth, of Madison county, who is giving much attention to the growing of wheat, and who is largely experimenting with the different varieties.

Mr. FANGENROTH—I am sorry that I cannot give the information that I would like to do. I can only speak of one kind of wheat, that is fall wheat. I have had no experience in growing spring wheat. I must say here that wheat lands may be made very productive. I have for the last four or five years raised wheat in defiance of insects, rust and mildew. I will endeavor to give you my experience.

First, in regard to my method of plowing for wheat. It has been said that trench plowing for wheat is injurious; it was so considered in my neighborhood when I undertook it. But I have practiced it for a number of years, and to this I now attribute, in a great measure, my success. We have generally had, in our neighborhood, failures in a wet spring, and have inferred from that that the wet spring was the cause of the failure. Now if we can overcome this difficulty by trench plowing, as I believe I have, I think we ought to succeed. When I came upon the farm which I now occupy it was considered worn out; the failure of crops was a common thing. It had never been trench plowed, but had been plowed only in the common shallow method.

Mr. DUNLAP—How deep?

Mr. FANGENROTH—Not more than three or four inches deep. The land was considered worn out. The first time I put in the trench plow I was not able to get down more than two and a half to three inches deep, for the reason that the ground was "furrow-trod," and so hard that it could not be plowed. At each additional plowing I went a little deeper, until this fall I have plowed my ground thirteen or fourteen inches, using the subsoiler, for the reason that I could not run the trench-plow deep enough. That which first led me to the practice of deep plowing was to get rid of the superabundance of water on the land in the spring, which seemed to be producing the frequent failures that occurred. Fall wheat, in particular, requires an early spring in order to ripen well.

I attribute also my success, in some measure, to the care I have used in selecting my seed, and if wheat growers would experi-

ment with different varieties of wheat I think they would do well for themselves and for others also. Last season I grew nine varieties of wheat. Of these, two varieties, the California and Tuscarora, were injured by the rust, which also was the case with other wheat which stood thick upon the ground. I also have red Alabama wheat, white May wheat, red May wheat, blue stem and Tappahannock. These varieties were sown in precisely the same manner, and with the same quantity of seed. The only way to find out just the variety that is best for your soil and location is by trial. The man who lives and grows wheat upon a clay soil cannot prescribe for a man who lives upon a different soil. Timber lands are more favorable for wheat growing than rich prairie lands. Where the ground is not drained the soil on the prairies is later than on the hills. The difference is frequently between eight and ten days in the ripening of some kinds of wheat; I have, therefore, always advocated the view that those living on the prairies should sow the earliest wheat, say the red May and white May. The latter is a very superior wheat. Next comes the Tappahannock, which has not been as satisfactory as desired or expected. The bearded wheat has not been much grown in our section of the country.

In selecting seed wheat I always take the best, and that which ripens together. It is all selected in one day. I will not have shrivelled wheat for seed. With proper care in selecting seed, and in preparation of the soil, there is no difficulty in raising good crops of wheat where heavy crops of clover will grow. I repeat there is no trouble about it. I regard deep plowing essential to success. It matters not how deep you plow, whether five inches or two feet, there will be found beneath the plow a hard crust, known as "furrow-trod." I would say use the subsoil plow first, and when there is formed this hard-pan beneath then put in your drains. It is too expensive to tile drain first, and is economical to use the subsoiler, as it will answer the purpose of draining for a time. Wherever there are low places in the field you must put in your tile drains, if you have an outlet.

My method of plowing is also different from that of any with which I am acquainted. [Here the speaker went to the blackboard and drew a diagram of a field of fourteen acres.] If an oblong field, I commence in the middle of the field, throw up a ridge and back-furrow. I stop short of the ends of the field, a

distance more or less, according to the size and shape of the field. The object is to plow in such a manner that the field may not be left in the shape of a basin, to hold water, as is the usual method. When the land is plowed in a way to throw the dirt continually outward, leaving a ridge along the fence row, which prevents proper drainage, I back-furrow the whole field, throwing the dirt continually inward, and away from the fence row. This leaves the land elevated rather than otherwise in the central portions, as it should be to secure proper drainage and prevent, on rolling land, the washing away of the soil. If you plow in lands or "seed beds," in the usual way, the water will carry off much of the soil. My method also enables me to turn upon the unbroken land, better for the land and easier for the horses.

Some say, as we before stated, that trench plowing is injurious. It may be at first, if the work is done in the spring, just before seeding. It is best to trench-plow in the fall and seed in the spring. Deeply plowed lands will retain moisture and stand drouth without injury when crops planted on shallow plowed land would burn up. I would advise all farmers to try deep plowing. Do not go to the greatest depth at first, but deepen gradually, and you will have all the benefits and none of the evils of deep tillage. Plow in the fall, and plow early enough to give the weeds a chance to rot before the cold freezing weather commences. If you plow early they will have time to rot and furnish food for plants; if you plow late they will not rot, and will hinder spring plowing and be in the way of the growing crops. The young plants will grow as long as they find nourishment. If the season is dry they will not find sufficient nourishment in the top soil, and certainly not in the weeds turned under late in the fall and remaining unrotted. Those farmers who do not practice deep plowing may get a good crop in a wet season, but they will get a poor one in a dry. My wheat crop, on poor land, averages 24 bushels to the acre, with an average weight of 62 pounds to the bushel. In regard to artificial fertilizers, I would say I have used them slightly, and at the same time I have applied a sprinkling of barnyard manure, with no very important advantage to this crop, on my farm.

Dr. Gregory.—What was the character of your season?

Answer.—Very dry in the latter part of it, and wet in the spring. Our wheat is more injured by the dry weather than by

the wet. New ground is sufficiently porous for drainage purposes; clover roots furnish drainage downwards. Then plowing in the method I have described, throwing your furrows inward, you will finally get rid of surplus water. I plow with a right-hand plow, and, as before stated, the team turns on the hard ground, which makes it easier for them, and the plowed ground is not injured.

Dr. GREGORY—Happening to be at Madison county fair, and seeing some fine specimens of wheat shown there, I begged for a few kernels to put in our cabinet, for the inspection and study of all interested in the matter. I now wish to request others to do the same thing, and send up specimens of the different varieties of wheat for the cabinet, and also for sowing here for trial. This is a matter of some interest and importance, and would doubtless do some good.

Dr. GREGORY—I wish to inquire whether any one has tried the plan of mulching the wheat plants as we mulch the strawberry. Have you seen this tried?

Mr. PERIAM—I would say it has been practiced in Cook county with most excellent results. It prevents the heaving of the ground, which exposes the roots of the plant and breaks them. This heaving is caused by the constant subjection of the land to freezing and thawing. It throws out the roots entirely above the ground.

Another fact which I have observed, that the localities for wheat growing are traveling west. We can raise wheat on new lands, but as the soil becomes old and worn we fail to get good crops. Sod land is the best for wheat. Wheat does not freeze out in sod land. We see an illustration of this in the vigorous stocks in the fence corners.

Mr. FLAGG—We have discussed pretty fully the preparation of the ground, and should now give attention to some other points. I therefore submit the following motion: I move to take up the question,

1. Of drilling and sowing broadcast.
2. The cultivation of wheat.
3. The time of cutting it.
4. Then of stacking it.
5. Next the question of threshing of wheat.
6. And, in the last place, the value of wheat as a farm product.

Adopted.

Mr. ROBINSON—In sowing wheat on the Illinois river we first summer fallow our ground. We plow our ground, if possible, in early summer, and pasture till fall. At seed time we plow again. I prefer, however, simply to run the cultivator. We sow about a bushel and a quarter to an acre. If the ground is weedy we sow a bushel and a half.

Mr. JEWELL—I am here to learn from the people of this State. I am not acquainted with farming in this country. I consider that a farmer in Michigan is not necessarily a farmer in Illinois. That is, he may understand farming in Michigan and not understand it in Illinois. In Michigan my experience is to plow early, even before harvest, and then not plow any more, but harrow in the grain on this early plowing. The farmers of Michigan find that they can raise from 20 to 40 bushels to the acre by this method. Formerly they raised but 10 to 20 bushels. In Illinois I have no knowledge of wheat culture.

Mr. FANGENROTH—I use the drill. If I can't use the drill I don't sow. I drill the same way that I plow my land, commencing in the center of the field and running with the furrows.

Mr. FLAGG—How much to the acre do you sow?

Mr. FANGENROTH—A bushel and a quarter.

A VOICE—How deep?

ANSWER—One and a half inches.

Mr. JEWELL—I understand that you recommend the drilling of wheat. Our drill in Michigan is not like your drill. Our drill is not a tooth drill. The tooth drills are all being thrown aside for our Michigan drill, which is supposed to be worth two bushels to the acre more than any other drill. The speaker gave a description of the drill. It consisted of wheels instead of teeth, and acted on the principle of the roller. In Michigan, on sandy soil, they work admirably, but how they would do in this soil of yours I do not know.

A VOICE—Does this drill leave the ground level?

ANSWER—It leaves it just as the other drills leave it. I may say, from my experience, the nearer the top of the ground you place the seed the better off the plant is. It will have a stronger growth and be better able to resist the frosts of winter. I sow all the way from one to two bushels. I would prefer one bushel if the land was in good order.

Mr. FANGENROTH—Sowing should be delayed until the ground has settled, otherwise the seed will be buried at an uneven depth and cause the ripening process to be uneven.

Mr. JEWELL—In regard to thick and thin sowing. I have seen wheat thin upon the ground produce 30 bushels to the acre, and I have seen wheat very thick not produce more.

Prof. BLISS—In regard to the quantity to be sown, I would favor the thin sowing, and depend for a heavy crop on the care with which the soil was prepared. One half the amount, sown on well prepared soil, will produce more bushels of wheat than the whole quantity sown in unprepared ground. This is my experience on prairie soil. I would say three quarters of a bushel, with the drill, is enough. I usually sow one bushel; but the yield from three quarters of a bushel is usually as great as the other.

With regard to the time of sowing, and the raising of wheat in general, I think we must study the particular season, and put as many things as possible in our favor. Drainage is as important as anything. It is quite as important that you plow your ground early enough. It is essential that the plowing should be early if you have a heavy stubble to turn under, that it may have time to rot. If you sow too early the fly is apt to injure the crop. If too late the frost will injure it. I would say from the 20th to the 25th September is a good time as a rule. Where there is a good deal to put in you must run from the 10th of September to the middle of October. Late sown wheat is also liable to be injured by the rust.

POTATOES.

A LECTURE BY JONATHAN PERIAM, SUPERINTENDENT PRACTICAL AGRICULTURE, ILLINOIS INDUSTRIAL UNIVERSITY.

The Potato, miscalled Irish, and botanically known by the name of *Solanum tuberosum*, or Tuberous-rooted Nightshade, is said to be found growing indigenous from Carolina in the United States to Peru in South America. It belongs to the vegetable order *Solanacea*. Among the edibles in this order of plants are the Tomato, Potato, Egg Plant, Pepper, the Ground Cherry, and that plant of doubtful utility, Tobacco. As a food producing plant among civilized nations, the potato ranks second in importance, has added millions to the human race, and has averted those famines which formerly swept over Europe, occasioned from a partial or total failure of the grain crops. An entire destruction of the potato crop, as was some years feared, would bring gaunt famine and death among the poor throughout the civilized world. It

may be well, therefore, to consider the history and diseases of this esculent, containing, as it does, so many elements conducive to human health, whose increased or diminished productiveness carries with it so much of weal or woe to the human family.

The natural history of the potato leaves us in some doubt as to its original nativity. It was carried to England, in 1565, by Sir John Wamkins, from Santa Fe de Bogota, where it is found growing wild, at an elevation of from 8,000 to 13,000 feet above the ocean, in elevated valleys surrounded by high mountains, and above the range of Indian corn. The climate is dry and cool, and, being near the equator, is not subject to great extremes of heat and cold. An attention to this fact will be of advantage to cultivators of this crop in climates not so well suited to it. It is said to have been known, at that early day, in various parts of North America; and after its introduction into England from Virginia, by Sir Walter Raleigh, in 1586, it began to attract more and more notice, until, at this day, the potato, as one of the root crops, and maize among cereals, have been among the most valuable food producing plants ever bestowed upon man. From a history of the potato, by Bonjean, published in 1836, and translated by Henry Meigs, we find the following: That it came originally from the intertropical parts of the American continent; that it grows spontaneously from Carolina to Valparaiso, in Chili.

The celebrated Joseph Pavon, one of the authors of the Peruvian Flora, found it growing wild in the vicinity of Lima, Peru, where the Indians cultivated it abundantly for their subsistence. Lopez de Tomera, a Spanish priest, in his general history of the Indies, published in 1553, mentions the *Papas*, the name by which it was known to the Indians. Joseph Acosta says that the Peruvians employed it in lieu of bread roots, which they called *Chunno*, or they ate them fresh and boiled.

Before its introduction into England it had already been very extensively diffused throughout the south of Europe. The botanist, Charles L'Ecluses (Clusius), about the year 1588, is said to have been the first European writer who mentions the potato. In 1631 he published a description of the root, and says that it was then so common in some parts of Italy that it was eaten by men and fed to hogs. He doubts whether it was known to ancients; thinks that it may have been the *Arachidna* of Theophrastus. Cortusus, another botanist, supposes that it was the *Pycnocoma* of Dioscorides. In 1590 Gaspard Bonhin received from Scholtz a colored drawing of the potato, and recognized it as a Solanum. Mathiola afterwards described it in his commentaries upon Dioscorides.

It was in Italy that potatoes were first cultivated to any extent, and from thence it began to be spread over Europe, about the year 1550. The Italians called them Tartoffoli, or ground huffles, and from this is said to have come the German name, Kartoffle. Parmentier, in 1783, succeeded in introducing the potato into general cultivation in France, and spent much time and research in demonstrating, by chemical experiments, that the potato was both a healthful and nutritious food. The following is a summing up of an analysis of the potato, by the author first quoted, Bonjean:

Starch, peculiar animal matter, bitter aromatic resin, Parenchyma (fibrous matter), Solanin, Asparagine, colored Albumen, a sugar principle, a gum principle, citrate of lime, citrate of potash, phosphate of potash, phosphate of lime, free citric acid, Silica, Alumine, Magnesia, Manganese, oxide of Iron, Iode, Brome and water of vegetation.

An analysis of the Mercer potato, conducted by Charles T. Jackson, M. D., of Boston, Mass., gives in 100 parts by weight:

Water	75.80 per cent.
Starch	12.54 "
Cellulose	3.62 "
Other matters, not separated	8.04 "
	100.00

In an analysis of the ash of the potato, according to Professor Norton, it contains:

Carbonic acid	10.04 per cent.
Sulphuric acid	7.01 "
Phosphoric acid	11.03 "
Chlorine	2.07 "
Lime	1.08 "
Magnesia	5.04 "
Potash	51.05 "
Soda	trace.
Silica	8.06 "
Iron	0.05 "
Charcoal in ash, and loss	0.07 "
	100.00

After its introduction into England, by Sir Water Raleigh, it was cultivated in Ireland in 1610, in Alsace in 1720, in Scotland in 1728, in Switzerland in 1730. Since this time its cultivation has been extended to every civilized country, and many barbarous ones, from the equator to the 64th parallel of north latitude, has added millions to the population of the earth, and has rendered almost unknown those famines which so often desolated the civilized world. Indeed, it has been said that if the sanguinary wars of the French revolution had occurred before the introduction of the potato, that Europe would have been decimated by famine.

How thankful then ought we to be, even in this day of degenerate potatoes, that they are left us at all, and how well spent would be the life of that man who could restore to us the potato in its original vigor and productiveness.

Very many theories have been, from time to time, promulgated relating to the deterioration of the potato, principal among which are degeneration, or a wearing out of its vital forces, which nature herself has disproved by recuperating, in a measure, this valuable esculent.

Another theory is that the disease is produced by excessive cultivation and high manuring, thereby inducing an extremely succulent and watery growth, and consequently a greater liability to be affected by atmospheric and other changes which are constantly taking place. That it is due to this cause, measurably, is patent to my mind, from the fact that the potato, when given its

normal condition, *i. e.* a cool and equable temperature, allowing it to make its growth without subjecting it to violent atmospheric changes, it uniformly produces fair crops, as, for instance, if we plant early York, Sebeg or Goodrich in this latitude in March, upon new or fibrous soil, however well manured, we may confidently expect to harvest a good crop about the first of August; and also, if we plant in June, we may expect to gather a crop in September or October, if the season is proper, that is, not wet and hot; these are conditions that are not suitable to a healthful growth of the potato. In fact, a season that produces good wheat is apt to produce good potatoes, but a season that is subjected to violent extremes of heat and cold, especially upon highly manured soils, is sure to deteriorate and reduce the potato crop.

The present season, for instance, was noted for an excessively hot and dry June and July; now if these months had been alternated with wet and cold, as well as heat, it would have followed that the potato crop, both early and late, would have been totally destroyed, but the early crop having covered the ground with their vines before the extreme drouth set in, they were enabled to mature a fair crop. Those planted later succumbed to the drouth, while those planted late in June grew slowly until the fall rains set in, and then perfected a reasonable crop.

Now the effect of high cultivation, and strong and especially green manures, is such as to induce an extremely succulent growth of vines, and while in this condition, if such weather occurs as would cause rust in the wheat plant or rot in fruit, the cells, being gorged with sap, are ruptured, and decomposition taking place, it is immediately seized upon by microscopic fungi, and unless seasonable weather succeed the poisonous matter is communicated to every part of the plant, and a total destruction of the plant ensues. That it is due to atmospheric causes, in a great measure, there is no doubt, and it is also as true that a hot murky atmosphere is the superinducing cause.

Indeed, the disease has not been confined exclusively to the potato, for, about the same time, we have accounts of similarly affected bulbs and roots, as tulips, hyacinths, the sweet potato, various vegetables and fruits, as tomatoes, the yam, the cocoa, apples, peaches, pears and other fruits. That it is due to engorgement, or something analagous, I believe—the rupture of the plant cells presenting a proper nidus for microscopic insects and fungi, the vitality of the plant is more and more impaired, until finally, as in the case of annuals, they are completely destroyed; but perennials may linger from year to year, until they finally succumb, or, during more favorable seasons, eventually recover. This is a principal reason that we find certain plants growing within certain isothermal lines, or where the temperature is natural to them, and it is not strange that the potato, requiring as it does such peculiar conditions for its normal development, being transplanted to such a variety of climates, should become diseased, and the seeds of that disease be carried, perhaps, to every country where it is cultivated. It is to be hoped that the examinations now being made, relating to microscopic fungi, under the auspices of our State Horticultural Society, and also by scientific individuals, may ultimately lead us to the point from which we may more satisfactorily account not only for this but other mysteries connected with plant life.

Under the influence of heat organized bodies expand. So do some at least under the action of cold, taking 32 deg. Farenheit as the initial point; under the influence of electricity, however, some are resolved into their component parts; under the action of heat and moisture, the circulation of plants becomes active, and under that of light, plants, through their leaves and otherwise, form their organized structures, from organic and inorganic materials. All material substances exist either as solid, liquid or gaseous. Chemistry teaches us that all substances consist of atoms. We know how inappreciable the spores of microscopic fungi are; that, under a power of 500 diameters, some are so infinitely minute that they are scarcely perceptible, and yet they are *composed of atoms*, a single one of millions. Perhaps there exist animalcula so small that it would take many millions aggregated together to become visible to the natural eye of man. Now since atoms mass from everything with which we are acquainted, their arrangement implies contact, and who shall say that the attraction and repulsion of these atomic bodies may not produce disorganization, decay and death.

Atoms, however, remain unaltered. They are unchangeable and indestructible. But organized substances are destroyed or changed according to the arrangement of their component atoms, and herein a field for the chemist lies. In determining the true condition of matter in the healthful plant, and the variable modifications produced by abnormal agencies, not in the abstract, but as by means of external and internal influence, as, for instance, in what manner the normal condition of plants are changed by various agents, since all matter is made up of proximate atoms. So do the various combinations of atoms produce and reproduce everything visible and invisible—the air we breathe, the forest, the microscopic animalcula, or the prize ox, swelling with fatness. And so does an abnormal arrangement of these atoms produce disease, decay and death; not by degeneration, but from disorganization. And the student in vegetable physiology, who solves the problem relating to the derangement of vegetable organisms, and the means of prevention, even proximately, will deserve as well of his fellows as the savior of a nation. In the meantime we must use such means as we already can compass.

I have already stated that the potato required a cool equable climate. Michigan and Wisconsin are celebrated for their fine crops of potatoes, so are Maine and Nova Scotia. Now it is known that the climate of Michigan, nearly surrounded as it is by extremely deep water, and protected besides by dense forests, has a comparatively equal climate; it is warmer in winter and cooler in summer, not subject to so violent alternations of heat and cold as are the more open countries in the same latitude lying west of Lake Michigan. In fact the delicate Carter potato is successfully grown on the eastern shore of Lake Michigan, 200 miles north of Chicago, upon the clearings of the dense forests, for the reason that their summers, although short, are marked by a steady degree of heat and moisture, sufficient to mature the crop; so of Maine and Nova Scotia.

Wisconsin is subject to greater atmospheric variations, lies nearer the great treeless prairies, but is at the same time sufficiently protected to be exempt from the more violent extremes.

Indian corn requires a much greater average heat to mature its crop than the potato, but at the same time it will stand greater extremes of heat and cold. The least frost blackens the potato vine, but the corn simply turns yellow, subsequently recovers, and under favorable conditions as to moisture and heat matures its crop.

Let us look for a moment at the theory of degeneration as producing the potato rot. It is essentially this, that reproduction, by extension as by layering, by cuttings and by eyes, tends to so impoverish the vital energy of the plant from generation to generation, that it continually becomes more and more weakened, until finally it dies. Now plants, as well as animals, may be called both viviporous and oviporous, not scientifically, but, if I may be allowed the word, as a condensed illustration; and some plants, as the potato, dahlia, artichoke, etc., are both oviporous and viviporous—oviporous as reproducing themselves from seeds or ovules, and viviporous, reproducing themselves by tubers, or offsets or buds. Now the seed, in order to reproduce the living organism, must first undergo certain changes, must be placed in its nest and be hatched; but in reproduction from the bud, it is fed by the sap itself until it has put forth its roots and leaves and is enabled to draw from the earth its proper nourishment. It seems to be a law of nature that the more we refine either the animal or plant, the more susceptible it becomes to climatic and other changes; that the more we refine the more delicate becomes the tissue; that the higher we feed the more liable are we to engorge, and with engorgement comes rupture, disease and death. We have forced the potato, by high feeding and extreme culture, into excessive growth; under certain atmospheric or other conditions, engorgement ensues, the cellular tissue is ruptured, the vitiated sap decomposes, fungi attacks it, and unless assisted by other conditions favorable to the normal condition of the plant, finally ends in its complete destruction, or partial disorganization, leaves it in so feeble a condition that it is not able to fully elaborate its starch, and instead of the dry, mealy potato, we have the soggy, waxy and watery one. It is no argument, for it is only a theory, against the theory that reproduction from seed does not bring it back to a healthful condition, for the seed being but a minute part of the whole plant, may necessarily be diseased from the parent, and might, perhaps, continue so for generations, until it wears out, just as fever and ague wears out upon the human patient. But under fortuitous circumstances, it may at last regain its original health and vigor. That it has not done so yet is apparent from the fact that to-day there is not in the United States a potato that combines the good qualities of the Mercer potato for an early variety, or, for a late variety, the pink eye of thirty years ago.

Horticulturists recollect the consternation that was created by disease and death in the apple orchards of Southern Illinois a few years since. It was laid to a variety of causes, principal among which was the theory that root grafting was the cause, producing disease and decay, or in other words it was degeneration, or a wearing out of the plant from decreasing vitality. Careful observation, however, showed the roots to be infested by the apple tree root-louse (*Pemphigus Pyri*), and now, under the microscope, we find fungoid

growth also, which may eventually be proved to have as much to do with it as anything else. The warty excrescences, produced by the Aphis perhaps, inducing fungoid growth, and a poisoning of the whole texture. It is a great field that is being opened, this one of microscopic examinations, and facts are proving every day that our best teachers are those who are investigators as well.

It may and does seem to many persons, otherwise intelligent farmers, that this labor of investigating the nature of microscopic fungi, both Phænogamous and Cryptogamous, so minute, as has been before stated, many of them, that under a microscope magnifying 500 diameters, the spores appear only as a fine mist, and it is quite probable that these tiny vegetable atoms may cause the loss of our potato crop, destroy our orchards, and render futile the exertions of the agriculturist. It is eminently proper that our legislators should foster institutions having for their aim the diffusion of scientific knowledge, relating to chemistry, botany, vegetable physiology, mechanics and microscopic examinations, connected with the arcana of animal and vegetable life.

It is to be hoped that the Legislature of the great State of Illinois, one of whose citizens conceived this grand idea of industrial education, the education of the masses to their several pursuits in life; we say that we hope that the State of Illinois will not be allowed to fall behind in this great scheme of industrial education because we have not the purse of a munificent and philanthropic Cornell among us, but will especially foster those schools which have for their aim the education of the industrial classes—the farmer and the artisan; one of which shall more easily feed the multitude, and add millions to the population, while the other shall harness yet undiscovered powers—an Archimedean lever that shall move the world.

The history of potato culture in Illinois shows plenty of failures, resulting from plantings in the month of May and early in June, for the reason before stated that the hot sun and dry atmosphere of July and August, or else the sudden alternations of wet and dry, hot and cold, are not conducive to the steady growth which the potato requires. But even under these circumstances, we may measurably succeed, by mulching, when the conditions are such that early planted ones do not perfect their growth before the heat of summer ensues. My own practice, upon clay or heavy loams, has been to plant as early in the spring as possible, upon deep fall plowing, by marking the land three feet apart, making a deep narrow furrow, which will of course be left filled with the fine earth. If you plant in hills, mark the other way, two feet apart, and put two strong single eyes in each hill. If in drills, plant the eyes about ten or twelve inches apart, stepping upon each piece in order to press it firmly into the earth, or if two rows are planted at once, this must of course be omitted, in which case a roller may be passed over the land before covering by the cultivator or hiller. Notwithstanding the assertion that it makes no difference whether the eye lies uppermost or not, I consider it bad practice to allow some eyes to lie up and some down, since they do not appear above ground at one time. Have them lie in the furrow as they are to grow, the eye up; cover about four inches deep. As soon as the weeds start, or the ground becomes encrusted, harrow thoroughly with a light drag,

and continue to do so as often as necessary, until the rows can plainly be seen, then, with any suitable implement, turn a light furrow away from the potatoes, and within four or five days turn it to them again, and continue to earth them from time to time, until at the time of blossoming the vines will be supported by a moderately broad and high hill. If the vines now grow so as to cover the ground and shade the ridges or hills, you may confidently expect to harvest a crop, unless the season is unfavorable, that is, wet and hot, or with alternations of heat and cold. I have gathered fine crops by filling between the hills with litter or fine manure, to obviate the effects of heat and drought. What the potato most craves is a moist, equable temperature of the earth, which can only be obtained, in variable seasons, by having the ground covered with the vines or mulch. If these conditions are secured you will not be much troubled with weeds, but if so you must get them out by hand or otherwise.

Neither potatoes nor any other crop will thrive among weeds. In case blight attacks them severely cut the tops, but if slight leave them alone—they may recuperate; and in no case, when attacked by disease, should you dig them to save them, they are safer in the ground than out, unless the land is very wet, in which case, if they are dug, they should be spread thinly, and some absorbent, as lime, powdered charcoal, or dry muck, mixed with them. When thoroughly ripe they may be dug and placed in narrow piles to sweat and dry, after which they may be stored where they are to remain through the winter.

I have often been asked whether I would plant certain seeds in the old or new of the moon. This planting in the moon, as it is called, is mere heathenish superstition, but like other pagan practices, which some of us follow, has fact mixed up with error. Seeds sprout more quickly in the dark and grow faster in the light, and therefore if we plant that which is slow to germinate, as the potato, in the old of the moon, it has the dark nights in which to break, and appearing above ground just as light nights come on, it absorbs carbon, grows apace, and vice versa. If we plant peas, which germinate quickly, in the new moon, *they* have the light nights to grow in; and so the fogyish, unscientific and superstitious planter has the facts on his side, only he does not know *why*. Therefore, if you must plant potatoes late, do it in the old of the moon, if it comes after the middle of June, but in this latitude I should prefer to plant, especially if early sorts, the first of July, rather than the first of June.

This brings us to varieties. After having tried all the new sorts, except such as sell at one to three dollars per pound, I still plant Early York, or Buckeye; if it is Buckeye, in March, for early, and in June and July for the late crops. And now about sorts. Last season I found but little difference in productiveness between Early Goodrich, Chenery and Sebeg; they ripened about together. Early York, however, produced the best crop. A new sort, Titacaca, said to have been brought from a lake of that name in South America, was two weeks later in ripening, and were perfectly hardy in tuber, seed and vine. The first eatable potatoes were produced upon Chenery, June 15; upon the 20th Goodrich, Sebeg and Early York were eatable; Jackson White,

Calico, Peach Blow and Harrison were affected by the drought to such a degree that they were a very light crop. They were all planted March 21st. More attention should be paid to the storing of potatoes than is generally allowed. Those intended for eating should be kept as much as possible from the light and air, and all potatoes should be kept at such a temperature as to prevent germination; but potatoes intended for planting certainly sprout more kindly and more quickly if they are exposed to the air sufficiently in the fall to become even greened before storing, on the same principle, perhaps, that the roots of trees dug in the autumn and healed in, get calloused and ready for growth in the spring. The planting of small potatoes cannot be too much deprecated, and why otherwise intelligent farmers will practice planting inferior and small potatoes, and at the same time be so careful in saving seed of corn and other cereals, is something wonderful. I have reduced a crop one-half in four years by the experiment.

A single strong eye, with a liberal quantity of tuber attached, is as good as more. In planting whole potatoes none but the strongest eyes grow, while if all the apparent eyes are cut out there will still be latent eyes, which, under favorable circumstances, will germinate. The small potatoes, however, in this day of high prices, may be utilized thus: Select a certain portion of the best potatoes, sufficient for the seed of the next year to be saved from, and if you continue this practice from year to year, you may plant the small potatoes for the market crop; but in no case must seed be saved from the produce of these small potatoes.

It is not necessary that we send long distances for change of seed. I have proved, from my own experience, that plants will not degenerate if care is taken to save seed from the best specimens, but will, on the other hand, improve.

DISCUSSION.

Mr. PARKS—I would like to ask for the experience of potato growers in regard to the Colorado potato bug. I wish to learn whether this bug attacks the potato in its perfect state.

Mr. H. DUNLAP—Yes; they will attack the potato patch in the spring, and literally eat it up.

Mr. PERIAM—I may state that I have watched this thing. I have not seen them actually feeding upon the potato in the spring, but I have found holes in the potatoes that might have been made by this insect. My experience extends only through two years.

Mr. DAGGY—I think I have seen the perfect insect feeding upon the young plants in the hot-bed, early in the spring.

Mr. H. DUNLAP had seen the same thing, and had his attention particularly called to it.

Mr. RICE inquired whether potatoes should be planted in hills or drilled.

Mr. PERIAM—You will get one-quarter more crop in drills. It is a question of time and labor. If you have time and labor enough plant in drills, otherwise in hills and in rows—both ways, so you can work with horse-power. I would prefer, in large fields, to plant in hills, three feet apart one way and two feet the other, just sufficient to get through.

Mr. MINER—I would ask in regard to sod land. Can we succeed in sod land in growing large crops of potatoes?

Mr. PERIAM—The finest crop of potatoes that I ever raised was by dropping the potatoes under prairie sod every other row. Still I do not think there is any economy in planting under sod if you have other land. It costs more to dig them from sod land. You must plow in the fall if you would raise a perfect crop of potatoes, and not fail in the spring to bring the ground into perfect condition.

Mr. COLMAN—I would prefer to turn over the sod in the fall if I wished a crop of early potatoes. I recollect one season, I did not plow my ground until May or June, and planted my potatoes in July, and started out on a lecturing tour, returning on the 8th of August. On examining the potato patch, found no potatoes there. Was again absent for six weeks, and when I came back I never saw such a crop of potatoes! I could not dig them all. [Laughter.] I would always recommend planting potatoes on sod land. The sod decays and furnishes excellent fertilizing material, suited to the potato.

A VOICE—Did you trench-plow?

Mr. COLMAN—No, sir; the season was rainy and just such as suited this crop.

VOICE—What kind of potatoes?

Mr. COLMAN—Neshannock.

Mr. GALUSHA—I have raised excellent crops of potatoes on sod, but the labor of digging is considerable, if dug in the usual way. This labor may be saved by taking the plow and turning the sod back again. The potatoes do not go into the ground, but lie just under the sod.

Mr. ROBINSON—I have been in the habit of raising potatoes on sod, with the best results. I turn two furrows. The first furrow is turned just as shallow as possible, to get a firm sod, and the second furrow just as deep as possible.

Mr. COLMAN referred to the method of growing potatoes under straw, and said that they would bring ten cents more per bushel in the market.

ROOT CROPS.

A LECTURE BY JONATHAN PERIAM.

Root crops may be classified as follows: First, those having long tapering tap roots, more or less fusiform, as the beet, carrot, parsnip, radish, turnup and salsify or vegetable oyster. Second, tuberous rooted plants, as the common potato, the sweet potato, Chinese potato or Japanese yam, the chufa or earth almond, and the artichoke, and bulbous roots, as the onion, leek, shallot, garlic, etc. These, therefore, hold before enlightened nations a most important place as sustainers of animal life, increasing always in importance according to the density of the population. Only within the last one hundred years have they occupied their proper place in the economy of animal life and the rotation in farm cultivation, and have enabled Great Britain, especially, to keep pace measurably in her agricultural development with her commercial and manufacturing interests.

The rudest form of husbandry known is the occupation of a herdsman, but one remove from savage life, inasmuch as the savage hunts, kills and eats wild animals, and the herdsman breeds, slaughters and eats domesticated or half-wild cattle.

From thence, by another step, we have the cultivation of cereals, then the planting of vineyards and orchards, and lastly comes in the cultivation of roots, herbs and flowers. A combination of these arts results in agriculture, horticulture being but a branch thereof, (the poetry of agriculture,) pomology, arboriculture, floriculture, etc., being subdivisions again of horticulture, just as the breeding and fattening of stock, or the cultivation of the cereals, or of the grasses for hay, are subdivisions of agricultural art. Science, in a high degree, can only be displayed by an individual in the study of one of these branches, and yet this subject, agriculture, has been too often looked down upon as being only fit to be subordinated to every other profession and art in life—this agriculture, which feeds the millions, and actually sways the destiny of nations.

It is altogether useless for the slovenly or negligent farmer to attempt the cultivation of root crops, since being of slow growth at first, produced from minute seeds, and requiring much labor, as compared with corn, wheat and other grain producing plants, he will be sure of failure. In fact, the so-called gardens or truck patches, of many otherwise good farmers, are a by-word and laughing-stock to the passer-by, the home of every vile weed that will grow in the climate.

There certainly is need of Agricultural Colleges in a country where more than one-half of the farmers are content to live for three-fourths of the year on bread and meat, with perhaps a scanty and precarious supply of vegetables, when one hundred dollars, expended in seed and labor upon a single acre,

would produce more healthful and better sustenance than double the amount expended in pork and flour, and doctor's bills, besides the enhanced pleasure in a higher enjoyment of life, produced by a table laden with various vegetable productions, important among which are tuberous and other root crops.

It is absolutely essential to success in the economical cultivation of these crops, that the land be in high condition, or it will be necessary to bring it so by deep plowing, heavy manuring, and the cultivation of some hoed crop of easy culture, as corn and potatoes.

Attention is also necessary to the nature of the soil. If it is wet or tenacious it must be rendered dry and friable by drainage and manures, which will act mechanically as well as chemically, always bearing in mind that root crops, except alliaceous ones, as the onion family, do not like recent manuring, unless it be compost, since it causes them to grow forked and knobby. The time spent in properly preparing the land will be amply repaid in the perfection and quantity of the crop. We stated in this morning's lecture that the potato ranked second among vegetable productions as a sustainer of human life. I now state that root crops come next in the scale of value as food-producing plants, and rank as follows: In that class, the beet, carrot and parsnip—all as esculents; and also the beet as a sugar-producing plant, the carrot as a promoter of digestion, and the parsnip for its saccharine qualities and as an excitant to the appetite. In the second class named in this lecture the common potato has already been noticed this morning. The sweet potato is well known for its saccharine and other nutritious qualities. The Chinese potato (*Dioscorea Batatta*), like other humbugs, has had its day, and therefore needs no other mention, but the chufa (*Cyperus Esculentus*), or earth almond, I think ought to have a place upon every farm. It is a perennial plant of easy culture, the foliage being grassy or rush-like. The tubers are produced at the end of creeping roots, varying in size from a hazlenut to that of an almond, which, when dry, they very much resemble, and are a highly pleasant and nutritious food, especially sought by children. Their cultivation is easy. Plant the tubers in May, in drills two feet apart, by six inches in the row, cover two inches deep, keep them free from weeds, and dig and dry them in the fall after frost comes.

The Jerusalem Artichoke (*Helianthus Tuberosum*) also is another plant which I think is generally under-estimated. It is of easy culture. It is not so rich in fat-producing principles, but in nitrogenous matter it is richer, as in sugar dextrine, albumen and casein, producing nerve, muscle, etc.

The next in the list for consideration among root crops are bulbs. The only one of principal importance, in an edible or sanitary point of view, being the onion (*Allium Cepa*), and deserves more than a passing notice. Notwithstanding the fact that over-fastidious persons object to its use, it still holds its rank, as it did among the ancient Israelites, as being one of the first among vegetables. It belongs to the same natural order (*Liliacia*) as asparagus, the hyacinth, tulip, squills, etc. The onion delights in a rich mellow loam, resting upon a dry subsoil, heavily manured with rotton manure. A good preparatory crop is peas, the land to be kept clean by frequent plowings; after removing that crop more manure may be added and a crop of

turnips sown after, which will leave the land in a fine condition for the next season's crop. Make the land thoroughly fine by repeated harrowing and rolling, it having of course been fall plowed deeply; sow the seed in drills fifteen inches apart, leaving the plants close enough in the drills so that they will not crowd each other when swelling, at which time it is beneficial to draw the earth away somewhat from the bulbs. Do not work the ground deeply, but keep the surface mellow, that it may easily absorb the dew and rain; when the tops are dry the crop may be pulled and thrown into thin windrows to harden and mature, after which they should be stored thinly in a cool, dry place until wanted. The cultivation of garlic, shallot and top-onion are identical with that of the common onion, except in the case of the garlic the cloves are broken off and planted, and shallots and top-onions are produced by separation and planting of the small bulbs. The cultivation, as with onions, is to keep free from weeds, and gather when dry.

The cultivation of the sweet potato (*Convolvulus Batattas*) is attended with considerable expense, but not so much as to preclude its cultivation as a field crop in the central and southern portions of the State. About the usual time that farmers commence plowing for corn the whole tubers should be laid upon a gentle hot-bed, upon about three inches of sand, on good earth, placing them about two inches apart, and covered with four inches of leaf mould or some other exceedingly friable soil. The land where they are grown should also be made as mellow as possible by deep plowing and thorough working. The ridges upon which they are to be planted should be raised, in any convenient manner, as high as possible, three and a half feet apart, and the slips planted therein at a distance of sixteen to eighteen inches apart, and kept perfectly free from weeds, and the vines not allowed to root from their joints. They should not be planted, however, until all danger of frost is over, and the ground is thoroughly warmed by the increasing heat of the sun. In the autumn, if the season has been favorable, a crop ranging from 100 to 200 bushels, and occasionally to 300 bushels, per acre, may be expected.

Beets, parsnips, carrots, salsify, ruta baga and turnips, in garden culture, should be sown in drills about sixteen inches apart, and thinned in the row to about six inches, except ruta baga and turnips, which should be thinned to twelve to fourteen inches apart.

Radishes may be sown in drills one foot apart, and thinned to about three or four inches.

We now come to the field culture of the beet, parsnip, carrot, ruta baga and turnip. It is not for a moment to be supposed that the cultivation of root crops are of any economical value as compared with the corn crop, as estimated according to the value produced for a given amount of labor. If it costs ten dollars to produce an acre of corn, yielding fifty bushels, it will cost eighty dollars to produce an acre of beets, yielding 1,000 bushels. Your corn stands you in twenty cents per bushel, your beets stands you in eight cents per bushel, therefore we can produce 400 bushels of corn for the same labor that we can 1,000 bushels of beets.

Ruta bagas and turnips will cost somewhat less, but are not so good for feeding.

Parsnips and carrots will cost as much as your beets, and will not produce so much per acre, but are richer for feeding.

Consequently, it is useless to argue with the stock farmer, at the present time, to prove the economical value of roots as a fattening crop, when raised upon old and recently manured land, but place root crops in their proper place in the rotation, and they will make a different exhibit.

In breaking up a clover lay, trench-plow a portion of it in the fall ten inches deep, paring the sod as thin as possible. Harrow and roll in the spring, when dry, until it is perfectly friable, drill your beets in before corn-planting time, thirty inches apart, tend with a horse as much as possible, and besides once thinning and once hoeing, you should have but little more to do until they are gathered. This will reduce the cost one-half, and you may confidently expect from seven to nine hundred bushels per acre.

Ruta bagas may be sown upon sod. Trench-plow in the spring, say about May 20th to June 1st, and turnips, broadcast, after early cut grass, or even as late as August 1st.

Mangle wurzel beet is the sort particularly adapted to field culture, from its habit of growing one-half of its length out of the ground, and instances are on record of fifty tons having been produced per acre. It is eaten greedily by cattle, sheep and hogs, both tops and roots, and four bushels will fatten as far as one bushel of corn, as usually fed, and they leave the land in the best possible condition, without replowing, for any crop of small grain.

But it is especially to the farmer of but few acres, who wishes, nevertheless, to fatten as much stock as possible, in order to keep up the fertility of his soil, that root crops are particularly valuable. Upon the farm of 160 acres, and less, half may be devoted to grass and hay, twenty acres to root crops—beets, ruta baga, turnips, carrots, parsnips and potatoes, as follows: ten acres to beets, five acres to ruta baga and turnip, three acres to potatoes, and two acres to carrots and parsnips, the latter two to be fed to horses and milch cows, twenty acres to wheat or barley, twenty acres to corn, and twenty acres to oats or rye.

In the rotation here mentioned, the manure should be applied to the corn land and the sod before trenching for the root crop.

Within five years I should not be afraid to guarantee, if all the crops, except wheat, barley and potatoes, were fed to stock, and the manure saved and faithfully applied to the land, that the produce of the farm, in each ordinary season thereafter, would be, starting with good arable prairie land, faithfully worked, 160 to 200 tons hay, or its equivalent in meadow, 15,000 bushels beets, 5,000 bushels ruta baga and turnips, 600 to 900 bushels potatoes, and 800 bushels each of carrots and parsnips. This would give nearly 22,000 bushels of roots, besides potatoes, which should produce 50,000 pounds of beef, mutton and pork, annually, which, at five cents per pound, would amount to $2,500 per annum, as the product of the twenty acres, besides the value of the potato crop.

But it is to the villager, or occupant of from one to five acres, that the cultivation of root crops are especially valuable. We have shown the quantities of the different root crops that can be raised per acre, and they are not fancy

sketches by any means, but are far below what are often raised. I myself assisted, when a mere boy, in the cultivation of two-thirds of an acre of ruta bagas, in 1839, the produce of which was 1,300 bushels per acre, individual roots weighing twelve to sixteen pounds each; and I have also in mind a prize crop of parsnips raised in the Isle of Jersey, in 1839, of 27 tons 8 cwt. per acre—30 tons 1,440 pounds of the present day—1,229 bushels per acre, at 50 pounds per bushel. The carrot will produce, usually, more than parsnips, and four bushels are considered as good for feeding as one bushel of corn meal. The principal value of carrots, however, is in feeding with grain, from its peculiar principle pectine, and its action on the digestive organs, enabling them to more readily assimilate the other food. But to return to the village farmer. Half an acre in beets will produce 750 bushels, and the mature leaves, stripped off from time to time, will feed a cow at night and four hogs principally during the summer and fall, and give for feeding, for six months in the year, over four bushels per day, which will fatten one cow and feed another for milk; and a quarter of an acre of parsnips will thoroughly fatten the four hogs, besides feeding four more growing ones until the next spring. Thus the village farmer of five acres may raise one and a-half acres of beets, parsnips and potatoes, half an acre of other vegetables, one to two acres of strawberries and other small fruits, besides corn and other crops.

The sugar beet, I believe, is destined to work a great change in the husbandry of many portions of our prairie land, and I see no reason, judging from its success in France and Germany, why it may not only supply us with sugar, both for consumption and export, but, in the vicinity of the establishments for its manufacture, so alter the system of rotation, as to be of great benefit to the farmer. Its success once established, will add millions to the agricultural wealth of the State of Illinois. It may be brought into the rotation once in four years, or oftener by the application of manure. A good rotation, where cattle are fed on the refuse of the sugar mill and the manure applied to the land, would be twice in a five-year rotation, viz: on sward trench-plowed, to be followed with small grain, then corn with all the manure, then beets, to be followed by small grain and grass, half of the farm to be in grass all the time, which would give 32 acres each year devoted to the production of sugar.

The cultivation of root crops, which has added so many millions of dollars annually to the agricultural wealth of Great Britain, and enabled that country to support its millions of population, is not simply due to the actual money value of the crop produced, but to the enhanced value accruing to the land by the feeding of cattle, sheep and hogs thereon, thereby increasing the production of the cereals by more than double over former years, and it is humiliating to us, with our deep rich virgin soil, that we do not produce of wheat, oats, rye and grass one-half that produced per acre by the English cultivator, and the difference is principally owing to the introduction of root culture in that country, with its attendant necessity, deep plowing; and the time is certainly coming when we too must adopt some such system to renovate our already partially worn land, and it is to be hoped that we may soon be enabled to institute experiments here that will tend to elucidate the facts

connected with the renovation of our soils by drainage. Deep culture, rotation of crops, a knowledge of soils and their adaptability to certain crops, and the economical value of feeding carefully upon our farms the product of our soil. This very county of Champaign, which was formerly noted for its fine stock, is now dependent upon Texas and the Red river country for the steers she fattens. In order to keep up the fertility of our land we must engage more in mixed husbandry, and in order that our land may carry its full maximum of stock, we must come sooner or later to the raising of root crops, unless something shall be discovered hereafter which will take their place. I should consider it one of the most important and interesting experiments that this university could institute, not that I suppose that an experiment in any direction, instituted and carried out by any public institution, could be prosecuted as cheaply as by a private individual, on account of the fact that the minute record kept, and other obstacles attending any public undertaking, tends to enhance the cost thereof; nevertheless, the results arrived at are certain, and consequently carry weight with them.

I have compiled from various sources the following facts:

Indian corn or maize contains about 20 per cent. of water and woody fiber; wheat 30; barley 30; oats 36; rye 22 to 32; buckwheat 40; potatoes 79; turnips 90; carrots 88; mangle wurzle 87; the artichoke 86; the parsnip 86. According to another analysis the parsnip contains more water than the potato, and less than the beet and carrot, a larger per cent. of starch and dextrine, and less nitrogen than the beet and carrot. Experiments in feeding show, however, but little difference in their value for feeding, except in the case of carrots, which, by promoting digestion, thereby enhance the value of dry food.

A curious fact in the cultivation of roots is that stated by Mr. Stevens, embodied in the agricultural report of the Patent Office for 1847, that in the cultivation of Swedes, the drills 27 inches apart and the plants 12 inches in the row, an average weight of 8 pounds would give the enormous yield of 69 tons, 4 cwt., English, or 155,000 lbs—2,582 bushels per acre. Therefore, if we reduce the average weight per root of this crop 2 pounds, or would diminish the yield 645 bushels per acre, at 10 cents per bushel, it would pay the whole expense of cultivating and gathering the crop, hence we see the necessity in root culture of rich clean land and careful cultivation, and, in fact, a lesson may be learned thereby that will suit as well for many other crops. As regards the feeding of root crops, the flat white turnips should be fed first, then sugar beets, if any are raised, then ruta baga, and lastly mangle wurzel. These last may be kept good even to June or July, with care. I would not, from any remarks herein set forth, have it understood that I consider that the time has come for making the cultivation of root crops an economical or necessary part of Illinois agriculture at present, except in the case of small farms and village plats. The great drawback, however, is the scarcity of proper help for their cultivation at the right time; nevertheless, I do assert that, as the country is more densely settled, it will become more and more necessary, and that even now, near cities and villages, where help and manure is plenty, it may well become an important part of ordinary husbandry.

DISCUSSION.

Mr. FLAGG—Speaking of the value of the root crop for food for stock. I would not wish to depreciate or undervalue this crop, especially as I am not familiar with it, but this I would like to say. It is my impression that in Southern Illinois, and in a great part of the West, we will find it more profitable and cheaper to grow apples than the root crops. I think that will be the case for many years to come. I would advise growing the sweet apple for food for stock. First, for the reason that the cultivation is comparatively easy, and, secondly, it is much less expensive to grow apples than root crops.

Mr. PERIAM—I would state that I do not consider the growing of root crops, in any country, of any money value so far as the crop itself is concerned, but it is chiefly on account of the condition in which these crops leave the land. I do not value the root crop except in this way. It has a prospective value. I do not know that the time has yet come when we can engage largely in growing root crops, but ultimately we shall find it of great importance, as is now the case in England.

Mr. FLAGG—I would ask how the root crop thrives in our country as compared with this crop in England. Is not our climate too dry and hot?

Mr. PERIAM—The turnip is not easily raised here, but the beet will do well on ground in a high state of cultivation. In good soil, thoroughly pulverized, the beet will grow smoother. In soil recently manured you will probably have side roots. They will go where there is food for them. The greatest value of root crops is in fitting the ground to receive other crops.

Mr. H. DUNLAP—I planted two ounces of beet seed and had beets enough to feed a milch cow for three months.

Mr. ROBINSON—Is it profitable to grow beets for sugar? and what per cent. of sugar is contained in beets?

Mr. PERIAM—I have not given attention enough to answer this question satisfactorily; I think, however, they will give 12 or 15 per cent. of sugar.

Mr. H. DUNLAP—Mr. Emery, editor of the Prairie Farmer, visited a sugar factory in this State, and I think they stated to him that the beets contained 6 per cent. of sugar.

Mr. PERIAM—It is probably 12 or 15 per cent. of nutritious matter, made up of sugar, starch and other substances.

AGRICULTURAL BOOK-KEEPING.

A LECTURE BY CAPT. EDWARD SNYDER.

The subject on which I am about to speak certainly does not offer as many attractive or interesting features as many others. Perhaps the simple reason for it is that book-keeping is not a science, it is an art. That is to say, it is something to be done rather than to be known. It is one of those branches of knowledge that have been called into existence by necessity and fostered and improved by experience, following in their development and completion the exigencies of time and business.

It would be a vain endeavor for me to put before you in the short space of time allotted to me the history of its development, or a review of all the different systems of accounting that have been devised by men, or engage in a scientifical discrimination of their respective advantages, merits and faults. I must, by necessity, confine myself to presenting you a few general views and points, which I shall divide in two parts, the usefulness and bearing of strict accounting in common life, and its application to the administration of agricultural establishments of a farm. I propose in the outset to face one objection, and to reply to it, which is too often made against book-keeping, and that is the almost utter denial of its being of any use. There are a great many men, more than is generally thought, whose ideas on the subject might perhaps be expressed in the following words: "What is the use of all that scribbling and cyphering? Why, if I were to keep a hundred books, they could not increase my income one cent; if I would double the number, they could not decrease my expense by one-half cent. Let us have as little of that bore as possible. The only chief book which I take care of is the pocket-book; I grasp that tightly. I make what I can, I spend no more than I must. That's the way I keep books."

Well, it is true, books have never been devised to increase income, nor to decrease expense—we cannot change the past, even by the most careful record; it has been and is done. But for all that, those men are sadly mistaken. There is no man on earth who would not sit down some time and go over the history of his toil and his pleasures, of his earnings and spendings, for those words are synonymous. I repeat, those men are mistaken, they do keep accounts; the only difference is that they keep them in their heads, subject to all the mistakes of that faithless ally, memory, that refuses to serve us very often when we need it most; the difference is that they must try hard to guess where they ought to know.

The usual excuse for the neglect of accounting with these men is the work; there is too much writing to be done; entries to be made every day in some big books, and that is too much work after a day's labor. And then, as they said before, the game is not worth the powder. That is their reason, or, rather, that is the reason they give, for in truth there is another deeper reason lurking behind, which I will proceed to give for their benefit.

Men dislike to account for what they do. They have a perfect aversion against every restriction, be it even in the innocent form of a record of what

they are doing. And this is especially true in money matters; they don't want to be reminded always by a record that they have been using hard-earned money foolishly and uselessly; if it happened so, let it rather be covered by the veil of oblivion. That is the true reason, though a very poor one. Now men would never think of, or consent to, handling somebody else's money or funds without keeping accounts, without being able to satisfy that party and themselves as to the use they make of it, and how they succeed in persuading themselves that they and their own interests are second to everybody else, is one of those strange freaks of human nature that are difficult to comprehend.

Now, for the sake of illustration, let us take a man, any man, let us just reach out into the throng of the thousands and grasp the first we meet with. Let him be a mechanic, or follow any pursuit of life, and let us see whether or not it would pay that man to keep accounts. Let us suppose that man is not engaged in any speculative enterprizes, but simply works at something for a living, earns what he can, and tries to conform his expenses to his means. Well, some day or another he will sit down and review the state of his finances. He takes out his pocket-book—the only book which he keeps—and, after counting and recounting its contents, he puts it back into his pocket with a great deal of disappointment, and a vague idea is in his mind that there ought to be some more money there—somebody must have assisted in expending his money, for he never used all that. He is puzzled and out of sorts, and goes over to the grocer to settle his account. He asks for his bill and finds it almost double the amount he reasonably thought he might expect, comes very near accusing that gentleman of cheating: but in looking over the bill he finds every item correct; he adds the column, no mistake there, so he sighs and pays. On turning the corner his tailor meets him and very politely puts him in mind of a little debt of some twenty dollars, which he ought to have paid months ago, but had forgotten it. He hastens to apologize for his forgetfulness and foots the bill, but goes home in a vague fear that on the other corner somebody might make a charge on his purse in the shape of some long forgotten bill. He tries very hard to remember whether he owes other bills, is very angry with himself, forms a resolve to keep things in better order in the future, but generally that feeling subsides, and he goes the old round over and over again. Now, gentlemen, would it pay that man or not to keep accounts? Would it pay that man or not to know where his money goes?

Leaving the answer to you, I digress to present to you another aspect of the case. Suppose that man had, by some adverse accident, to reduce his expenses to a certain degree, to meet a diminished income, how would he be able to tell which of them are real necessities and which could be possibly avoided? He will be in the same dilemma as when he explored his pocket-book; he will fail in the attempt sure and certain.

The fact is but few men know what they really want for living, excluding all unnecessary expenses. It ought to be the duty of every man to ascertain that. It would arm him against every reverse of fortune, and if for no other reason this alone should be sufficient for every man—I admit no exception—

to keep account of his earnings and spendings. Success is the aim of life, of every business, but our success in life will be much affected by the intelligent use of our means, and our well being will almost chiefly depend on our ability to supply all our reasonable wants. Wealth in general, or money, is the means of procuring and satisfying all our material wants, and we cannot be too careful in handling that powerful element.

It is true, wealth is a relative quantity, every man carries his own standard of wealth within himself. One might be satisfied with a few thousands of dollars, another's desires might exceed a million, but I persist that if we succeed by strict account and control to ascertain the sum of our wants, we shall certainly be better able to work for the attainment of that aim.

Another thing deserves mention here, and that is the fact that in our present age many men incline to live beyond their income. The form of society, fashion, the multiplicity of wants which civilization naturally carries in its train, and the tendency of well living to gratify all the longings of a refined and cultivated mind and taste, may be the reason of it. Now I pretend that if anything can possibly check this tendency it is the keeping of accounts. I declare it incompatible with common sense to have, every time we foot the pages of our book, those silent witnesses of dissipation stand out in bold relief, and not to think of remedy. And the thought once conceived, half the work is done; plans to amend the deficiency will suggest themselves, action will follow the thought, and, if anything, that might cure.

Returning to the relation of book-keeping to life, I desire only to say that it has the same relations to practical life as every other and all the other sciences and arts in the broad field of human knowledge and experience. That is, it will become important just in proportion as it is found to be useful. Let us take any of the sciences to illustrate this theorem, for instance, chemistry. When at first, in the dark ages of the Mahometan conquests, taken up scientifically, men grasped the discovered principles with the full ardor of enthusiasm; leaving behind them the demands of practical life, they strayed off into the realms of speculation. Science, principles and theories were all, their connection with practical life nothing. They rose up to those sublime heights of science, wrapped in mysteries and clouds, and removed from the view and comprehension of common people. Chemistry was a mere pure science then, but did it enjoy the universal esteem, was it thought of so much importance as now? No, and deservedly not. It was only when it stooped down to our wants, when it went out into the field with the farmer, when it entered the workshop of the mechanic, in one word, when chemistry came to live among us, that we conceived its importance, just in proportion as we found it useful.

To-day it has entered our households; the time is near when our ladies will not be satisfied with the common fact that when they put cream in the churn and move the handle up and down the result will be a lump of butter; they will inquire into the reason, and I hope that the solution of such questions will afford them not only satisfaction and pleasure, but also benefit them. It is only when we admit an art or a science into our very household, when we

grow perfectly acquainted with it, that we can avail ourselves of its aid and judge of its practical value.

I have recently been reading an Essay on Economy, of a French author, who, in speaking of Holland, says that the ladies of that country are the most economical, the most intelligent economists he ever met. He ascribes this to the fact that the Holland ladies are required to keep formal accounts of their domestic expenses and receipts. That they make out yearly statements, showing what was spent in every department of the household, and that they take a great deal of pride in the accuracy and correctness of those accounts, exhibiting fully the judicious use they made of their funds. He quotes, as a singular coincidence, that the Kingdom of Holland has scarcely any national debt, a singular exception to the heavily indebted European countries. It is a strange coincidence we must admit, but there is a connection between those two facts, nevertheless. The financial affairs of the Kingdom of Holland are simply a reproduction and the sum of all its domestic affairs; the sense of order and economy, inculcated by their mothers, carried their effect into public life just as sure as the reverse would have done.

We might inquire here, what is economy? Is it the saving, the hoarding of the almighty dollar? Is it the stingy and miserly self-denial of life's enjoyments for the sake of accumulating wealth? No; it is just as far from the one as it is from the other; just as far from the spendthrift as it is from the miser. It is the right use, the intelligent use, of money or wealth. How many, how very many, men will take a five dollar note and spend it uselessly, satisfying the desire of the moment, gratifying one passing thought, without thinking that that amount represents the weary toil of nearly a week's hard work of the average of men. For what is money but the conventional mark of men and women's work? Gold and silver have not the power to satisfy any of our desires or wants—in their form a mere matter—nor has their substitute, the paper currency. Men and women's work is the only value on the face of the world. Everything is esteemed and valued by the amount of work that its production cost. If a barrel of flour cost $15, it is because it takes just as much work to produce it as there is work in $15.

But in order to arrive at the intelligent use of money, of that product of our toil and work, into our intellectual faculties, we must control that use, must call ourselves to account for every part of it which we employ to satisfy our desires and pleasures.

As soon as we step out into life and business, the importance of well regulated accounts becomes at once more prominent. A merchant can never think of being without correct accounts and books; it is forced upon him by necessity; it becomes there the very next thing after the business itself. It would be useless to recommend it to them, they know and appreciate its value. And still there are many, full too many, instances of indifference, incompetency and negligence, even among those men; but there the results are so striking that there are comparatively few that would not do their best to fill the bill, for we know by experience that in nine cases out of ten we can trace every failure in business, every bankruptcy, to that very source, to the deficiency of accounts, to which we ascribe many a ruin in common life.

The farmer is a trader; after buying a farm he is a merchant. His success depends partly on what he grows, most on what he sells and how he sells. If producing is the first condition, the selling is certainly the second condition, and the conforming with the demands of the market just as important for him as for the merchant. What has been said of the merchant is equally true of the farmer; no intelligent management of his business is conceivable without full and correct accounts, because the information to be derived from them is just as indispensable to him as it is to the merchant.

Here we must insert a definition of book-keeping. In most of the text-books we find the following: "Book-keeping is the science of recording business transactions." This definition I believe, leaves out the main requirement of book-keeping. Why, the mere recording of a transaction would not satisfy any business man; a schoolboy could write down everything that happens in some form of a record, but that still would not be book-keeping. I say we must be able, from our books, to learn at any time the whole state of our business. We must keep, always ready, our records in such a form that we may be able to condense them without much work into one statement, where we can encompass at one glance all our affairs, and also their results.

There it is where many make so strange mistakes, and waste their work in the mere form of recording. I have often been told by parties, "Why I did keep books, and I have taken a great deal of pains to have them full correct, but somehow they failed to satisfy me—they did not show what I wanted." Where was the mistake? That man had certainly recorded everything that he thought worth knowing, perhaps too much of it. Well, he succeeded admirably—his work was a record and nothing more.

It is always so in nature: we must be disappointed if we expect from given causes more than their natural effects. Cash-book, day-book, ledger. We are driven here to the conclusion that in framing a system of books, we must steadily keep the end in view; we must clearly and fully ascertain what we want our books to show, then give our records the necessary subdivision and bearing; we thus avoid disappointment.

The question suggests itself here, "What do we want our books to show?" We might condense the answer in five points.

1. What we have.
2. What is owing to us.
3. What we owe.
4. What we have gained or lost.
5. How much we have.

Here we must mention the two great divisions in the various systems of book-keeping—by single and double entry. They are just what their names imply. The first records record every transaction once, as I might say in answer to the question "Where is it?"

The second is a more complicated system, whose origin we can trace back as far as the twelfth century, and which is said to have been hit upon in Venice, Italy. Its chief characteristic is that a twofold entry is made of every transaction, as if it be in answer to the two questions, "Where did it come from, and where did it go to?" Of the above given five requirements of a

set of books, single entry will fill the first three conditions, the fourth it will answer indirectly. In order to have them all correctly answered we must keep books by double entry. As I have demonstrated to you that the closing of books, the producing of a statement of our business, is the chief aim of books, I present to you herewith the close of a set of books of single and double entry. [Demonstrated.]

In the balance-sheet and loss and gain account of the double entry closings I have indicated the account which I think must be necessarily represented in a farmer's books. And here the reason comes in why agricultural books, by the very nature of the business, are more complicated than the books of the common merchant. It is because the farmer is something more than the merchant; he is also a manufacturer, and he must therefore adopt in his accounts part of the system used in manufacturing establishments—that is, the balancing of the cost of material and labor against the product, or else his account will leave him in the dark about wherefrom and how his gain comes to him from this or that department.

If the farmer wants to know, not to guess, how much a bushel of wheat costs him, and consequently how much he makes on it, he must do exactly the same way. If he thinks it desirable to know the produce of his orchard, he must keep account of that part of his farm. He is free to make his choice between the two systems, let him select whichever he sees fit, but abide by the results; but never accuse the art of its incompetency of fully tracing all the phases of business, if rightly used. I will also put in here the remark, that though the double entry system might seem complicated it does not require much more work. The work of recording will be the same; it is only the place to be carried to, and the way of systematizing, that is the difference.

I am perfectly aware that I have not thrown all my remarks into the path of agricultural book-keeping and its form, but in taking you over the technical dry forms that have been devised, to intelligently discriminate between their merits and uses would have taken more time than I possibly could occupy, and I am afraid would have tired out the larger part of my audience. I hope and wish that some future day I shall be permitted to put before you systematically the arrangement and development of a full set of farm books, also to give you a synopsis of the so-called tabular system, which is used in the administration of the larger estates of Middle Europe, and shall be ever eager and willing to confer my mite to the advancement of the agricultural interest of our country. For if we cast one searching glance into the future of this country, we can easily discern that agriculture and the industrial arts will be the great basis of its development and grandeur. We never shall be a warfaring nation of conquerors. The very nature of our institutions, the form of our government, will protect us from that disaster. We hardly ever will be a people of traders; our seacoast may, but the great inland stretch of 4,000 miles from east to west, will be the emporium of agriculture—of agriculture in such perfection as the world never beheld before.

This reminds me of a quotation, which is ascribed to Franklin, where he says, "There are three ways for a nation to acquire wealth. The first is the

way as the Romans did of old, plunder the neighbors, and carry off what they have. This is robbery. The second is trade—but great profits in that direction naturally imply cheap buying and high selling, which has a tinge of cheating in it that we know by experience never proved beneficial to the character of a people. The third and the only honest way for a people to acquire wealth is agriculture and industry—we must grow and manufacture what we want, and so much more to exchange for the necessary products of other soils and climates."

America has indeed followed Franklin's opinion; she is under full headway to establish her grandeur on the broad honest basis of agriculture and industry.

ORCHARD FRUITS.

A LECTURE BY DR. E. S. HULL, OF ALTON, ILL.

ORIGIN OF ORCHARD FRUITS.

To grow orchard fruits you must have orchard trees, and to grow either or both successfully, requires a knowledge of the laws of vegetable growth. These laws are so complex as to require careful observation, much time and thought. It is not our purpose to enter into a full explanation of these laws, and yet reference to some of them will be necessary in order that we may know how to modify their effects on our trees and on our fruits.

All our trees bearing improved fruit have been brought to their present condition by reproduction from one or other of the wild or unimproved species to which they belong. If we carefully compare the wild or uncultivated tree with one of their descendants, we shall at once be struck with the change which has been effected. The wood, the leaves, the fruit, how changed! One is ready to ask, can it be possible that such large and luscious fruits as Howell or Beurre Bosc pears could have descended from the harsh fruits of the thorny trees indigenous to the European and Asiatic forests. The apple, too, which has been called the king of fruits, once existed only in thickets in the same countries with the pear, as a thorny, compact tree, whose fruit was small, and of a quality not better than the fruits of our native crabs. From these, and from similar beginnings, all our improved fruits were derived. This great change was produced in the simplest manner, viz: mainly by stimulating the growth. In this way an enlargement in the leaves, and a slight increase in the size of the wood cells, was effected. From trees thus wrought upon seeds sprang up; these in turn being subjected to similar treatment, in the next and succeeding generations were further removed from the wild type, until at length the small, compact and thorny branch has been turned to one much smoother and larger, the fruit of which is of the highest excellence.

How great the change is which has been effected, will best be understood when we state that among all the species of fruits which are now grown in our orchards, not one of them, when in their wild state, could at all compare in quality with our persimmon. But all this has not been done without to

some extent affecting the hardihood of the trees. The cells of both wood and fruit, the leaves, the branches and the pores, all are so enlarged in our improved trees as to retain only a semblance of the native stock from which they were derived. With the structural parts so enlarged comes countless blights and diseases, which have, in the course of a few years, spread to all parts of the land. To some of these diseases, also to the structural change which takes place in the amelioration of fruits, we shall again briefly refer.

NURSERY TREES.

Orders for nursery trees are generally given to nurserymen residing north of the place where the trees are to be planted. This is done under the impression that northern grown trees are hardier than trees grown at home or south. When or how this conclusion was arrived at we do not know; that it is erroneous we think may be shown. For example, if we examine trees grown far north, we find that their growth is often checked by frost at a time when the new cells, although perfectly formed, were yet soft. These soft cells resemble more those of succulent than hard wood plants. There will also be found to be present a large supply of unorganized materials for the formation of other cells which cannot be elaborated by the tree in its present condition; these young trees are therefore gorged with crude juices, which are greatly expanded by the severe frosts of winter; the new cells are burst, and the unorganized materials in the tree ferment and destroy the healthy parts with which they are in contact. On the other hand, trees grown very far south are, on the approach of winter, sometimes in a situation so similar to trees grown at the north, as to deserve a passing remark. Owing to the great length of the warm season, trees at the south often cast their leaves at midsummer, and after a short period of rest they make a second growth of leaves, which cannot be matured before they are killed by the frosts of winter. When this occurs, both the northern and southern trees are in the same condition; both are largely supplied with crude matter which they cannot mature, and hence the trees of both sections will be found to be too tender to withstand, uninjured, our mildest winters.

If the facts we have stated are borne in mind, they will afford a clue to the treatment trees should receive at the two extremes of latitude at which it may be desirable to grow them. For instance, a tree at the north should be so treated as to enable it to mature its growth some days or weeks earlier than they would do if cultivated as they commonly are. On the other hand, trees grown at the south should receive such culture as would prolong growth to as late a period as possible, and thereby avoid the summer rest and tendency to a second growth. If these conditions are secured, the trees of both sections will be as hardy as those which grow at an intermediate point, where they mature at the proper time without artificial aid.

SPONGIOLES OR ROOT HAIRS.

The removal of trees necessitates the loss of by far the larger part of their small fibrous roots, but not of spongioles, as is erroneously supposed, since, at

the time trees are at rest, their roots are destitute of spongioles. That this is so may be known by inspecting the roots in the spring. At this season of the year roots will be entirely destitute of spongioles, but as the period of growth arrives, from their sides, especially of the smaller roots, will appear many small warty excrescences. These excrescences are made up of a vast number of little bladder-like cells; each new cell, as it enlarges, divides into two, and each of these again divides and is added to those already made. In this way it is, by the multiplication of cells, that new roots, as well as other parts of trees, are formed. It is to the sides of these newly formed rootlets that the spongioles are attached. These spongioles, or root hairs as they are sometimes called, are not roots, nor do they ever become such, any more than leaves above ground become branches. The office of the spongioles appears to be to extract food from the earth needed by the tree in the season of growth; they act in concert with the leaves, and in the autumn they separate from the roots. Therefore, from the fall of the leaf until growth commences in the spring, all our deciduous trees may be said to be spongioless as well as leafless.

Shall we grow our trees with branches starting from the ground, or shall we prune; and to what height? These and similar questions are now often asked. We think it would be superfluous to give any instructions in growing fruit trees to low heads, since for the past sixteen or eighteen years all our journals, both horticultural and agricultural, have vied with each other in descriptions how best to accomplish, as they supposed, so desirable a result. Indeed so much has been written on this point that we have gone from trunks six to eight feet high down to those of as many inches. These low-headed orchards, on coming into bearing, have disappointed, or must soon disappoint, their owners. The conditions attending the growing fruits are now so changed from what they were but a few years since, that trees with low heads are in the main no longer a success.

They increase the labor of cultivation many fold. The low branches cut off the under circulation, inducing disease in the foliage and not in the fruit. They invite insect enemies, and make it difficult if not impracticable to arrest their ravages. In short, low heads are a failure, and the sooner we can induce people to start the heads of their trees at a proper height, the sooner will it be possible to successfully destroy insects, to ward off diseases, to insure color to the fruit, and make it practicable to cultivate quite up to the trees by means of horse power.

In planting an orchard we select trees according to their kind—apricot, peach, plums and cherries, one year old, from bud or graft; apples and pears, two and three years old.

The four first named, if well grown, will be not less than five or six feet high, and will have many side or lateral shoots branching out horizontally from the main or vertical stem. In addition to the side branches, there will also be found numerous buds, extending from *the ground to the top of the tree.* Cut away all the branches and buds to the height of twelve or fifteen inches. Next cut away all the buds below the point at which it is intended the tree shall form its head, except six or eight buds, which are to be left at regular

intervals and on different sides of the stem. These last mentioned buds will push into as many branches *as there are buds.* It will be necessary to keep these side branches pinched back to ten or twelve inches during the summer, to prevent them from running off with the growth and robbing those buds and branches selected for the future head of the tree. Sometime after the fall of the leaves and before growth commences in the spring, reduce the side branches to one bud each, and when the branches from these buds shall extend to ten or twelve inches, pinch them as directed in the first year. The treatment will be the same the third year as we have directed for the second, except at the end of the season cut away all the side branches except those intended *to form the head of the tree.* The object of the side branches, of which mention has been made, was to strengthen the stem or trunk of the tree. Without them the trees would have become top-heavy and bent the trunks. Trees grown as we have described will have straight and tapering stems, which will be of sufficient strength in their fourth year to stand erect.

BUDS, GASSES STORED, ESCAPE OF GASSES, CAUSE OF DEATH, ETC.

To show the effects which frost, overbearing, and succulent growth have on the fruit buds of orchard trees, it will be necessary that we briefly describe those parts of the bud to which we shall refer. The buds of stone fruits of orchard trees may be separated into two classes. First, those which contain single germs of fruit, as the apricot and peach. Second, buds that inclose several germs, of which most varieties of the cherry are examples. Since the structure in both of these classes of buds differs only in so far that several of the latter are folded in one envelope, a description of one class will answer our purpose for both. The germ of all our stone fruits at first consists of a single cell, and this is situated in a small cavity, which, according to some botanists, consists of an embryo leaf, folded by the tree into a form much like a vase, but more tapering at the top; the sides or wall of the cavity thus formed is made up of numerous small cells. To appearance these cells are built up around the germ cell much as a mason would inclose a conical space with brick, with the ends pointing to the center. The cells at first are soft and readily press together so as to perfectly touch each other and make a close wall. The forms of these cells differ from wood cells in so far that the exterior and interior surfaces are not pressed upon by other similar cells, as in woody structure, and hence they appear, when viewed from either surface, to be of an oval form.

The parts of the bud we have described, and to which we shall refer, are covered with the corolla, which is the colored part of the flower, the calyx, which forms part of the envelope of the bud, and the scales, which inclose the whole.

Large and improved varieties of fruit we produced only on trees which have much larger wood cells, annual twigs and leaves, than seedling trees or those with small fruit. The buds of improved varieties are also large, and the scaly portions covering the interior parts of the bud are folded together more loosely than in smaller ones; so large and loose are some of these exte-

rior scaly coverings, as in the Melocoton family of peaches, that it frequently happens that moderate freezing of the buds, especially while they are wet, partly unfolds them, so as to admit of the escape of what is believed to be carbonic acid gas, which, so long as it remained, protected from frost the little wall of cells which inclosed the fruit germ, as in the peach. Gasses or fluids not only inclose and protect from the effects of frost the exterior wall of the cells that surround the germ cell, but the cavity in which the germ cell is inclosed is also filled with carbonic acid gas or other fluid, as has been ascertained by puncturing, and to which experiment we shall again refer.

Hence it never occurs that the germ cell, or the interior surface of the wall of cells surrounding it, can sustain injury until an opening is made in the wall by separating one from another the cells of which it is composed. But so soon as an opening is made the gasses or fluid escape and the germ is killed.

That the escape of gasses or fluids stored in fruit buds is destructive to them, as well as to the embryo leaves inclosed in the leaf buds, may be known by piercing the buds with a small broach not larger than a hair. If this is done in cold weather, the bud, whether it be leaf or fruit bud, is immediately killed by freezing; but if we perform the operation on a warm day, the bud will retain its vitality until frozen. If we delay, and puncture the bud after freezing weather is past, then the germ of either leaf or fruit will grow as though the puncture had not been made, except that in the leaf a small hole will appear, and the fruit will develop a scar at the wounded part.

It not unfrequently occurs that, very early in the spring, a small brown fly pierces the side of the wall of cells to obtain the sweet substance stored within. This it often does without preventing the growth of the germ.

In view of these facts it appears that the gasses or fluids are stored in the buds of trees only as a protection against frost. It will be asked, if the buds are protected against cold as we have stated, why the leaf buds are not killed at the same temperature that kills the fruit buds? The answer to this is, that the fruit buds have a larger share of nutriment stored in and around them, with which to commence growth, than is stored in leaf buds, and it is perhaps on that account that the fruit buds are most excited and are first to expand. But, most of all, the less power in the fruit bud to resist extremes is due to the premature separating of the calyx and scales covering the bud, induced by growth of the interior parts of the bud. This inside growth of the bud is due to the increase in size of the individual cells that surround the germ, and as these enlarge they expand the outside coverings of the bud, so as to make them more susceptible to moisture and ruptures by frost.

Therefore, the power of buds to resist cold is determined by the condition of the buds at the time the freezing occurs. For example, in the winter of 1856 and 1857, at Alton, the thermometer indicated 20 deg. below zero, and when carried a few feet away from the building it sank to 27 deg. below zero. Notwithstanding the severity of the cold, the Alton district was, the following summer, noted for its great yield of peaches. Our observations at the time went to show that the injury to the buds was only as one in eight.

Perhaps at this point we ought to explain the conditions combined to produce such favorable results. The trees having borne no fruit the summer preceding the winter to which we have referred, continued to grow until near the period of frost. There was, therefore, no premature swelling of the buds, as is quite common in the fall. The scales covering the interior parts of the buds were closely folded. Even the large and pointed buds of the Crawford's early and late varieties, which are classed among the tender peaches, were in a condition seldom seen at so late a period. The ends of the calyx and scales, which in these varieties usually appears to be partly open at the end of the bud, were so closely folded as to exclude moisture. In short, the buds were perfectly developed, and, up to the time of the severe freezing, had not frozen in the least, and were, on that account, in a condition to resist the lowest temperature possible for buds of the peach to endure.

Perhaps no injury sustained by fruit buds is more common than the bursting of a single cell in the wall inclosing the germ-cells. When hard freezing occurs, it sometimes happens that some of the cells pointing at the outer surface are ruptured; when this happens to only one cell, the exterior coating of the cell is held in place, and the fruit grows as though the injury had not occurred; except at these wounded places a scar will appear on the surface of the fruit. Also, in the early stages of growth, these wounded parts afford resting places, to which some of the cryptogamous plants attach and rot the fruit.

All our orchard fruits are more or less liable to this casualty, but most some varieties of pears; next, the English Morello, the Heart, and some of the Bigarreau cherries; peaches and plums somewhat less, and, as a rule, apples least. The germs of all fruits are most liable to injury in the way we have described the winter after they have produced heavy crops.

When two, three or more contiguous cells are burst, the fruit-germ generally perishes within a few hours or days, or, if the bud blooms and the fruit matures, the scar remains and arrests growth at the wounded part. When several ruptures occur, but on different sides of the wall surrounding the germ-cell, and the fruit matures, as is sometimes the case with some varieties of apples, then the fruit becomes knobby and of little value.

It not unfrequently occurs that fruit buds are changed to wood buds in the season of growth; this takes place only in trees, or parts of trees, that are making a very succulent growth.

All who are familiar with the practice of budding the peach will readily call to mind examples of this in stocks budded early in the season. If, under a microscope, we examine fruit buds taken from a tree of very succulent growth, we find in some the single cell or fruit-germ is wholly wanting; in other buds it is present, but the little wall of cells, of which we have previously spoken, is incomplete, one side being built up to the proper height, while in another part much is wanting, and in others the wall cells are so loosely placed as to suggest the possibility that many of the little cells had perished, leaving openings that remind one of a brick wall with many of its bricks pulled out.

This kind of defect in the buds of all our fruit trees is by far more common than is generally supposed, and often is induced by a cause directly the opposite of the one we have described, as will be known by an examination of buds grown on trees which have, the previous summer, produced an overcrop of fruit. A large proportion of buds on trees that have been overtasked are so like those of trees which make too succulent growth, that a description of one answers for both.

We well recollect the congratulations we once received of some fruit men, on viewing a vigorous peach orchard of ours in its fourth year, which was then full of bloom. We also remember how hard it was to make them understand, on account of the vigor of the trees, that, on the whole orchard, not a single peach would probably be produced.

Similar examples with the pear must be known to many now present. It is not uncommon for estimates of pear crops to be based on the fine display of fruit buds, and for the whole to prove abortive, from one of the two causes last named, but especially to the latter, and not to imperfect fetilization, as is generally thought. All, doubtless, are familiar with the fact that certain free growing varieties of apples, as Northern Spy, Yellow Bellfleur and others, on rich land, are many years barren of fruit; the trees bloom but the germs are defective by reason of the wood growth carrying away the nourishment needed to perfect the fruit-germs. The tendency of some varieties of fruit trees to produce overcrops one year and to pass through the following or alternate years without fruit, is well known. The varieties of fruit that are complained of are those only in which the tendency to wood growth is early completed, and at a time when both the roots and the leaves are active in elaborating plant food.

In some varieties all the food collected by the trees seems naturally to go to the formation of woody growth; in others it seems just as natural for the wood growth to cease in time for a portion of the leaf buds to change to fruit buds. When the terminal buds on the current year's shoots show themselves early, then the leaves continue active in the production of plant food, which is stored in all parts of the tree; buds which before were only leaf buds are changed to fruit buds. Sometimes a large proportion of the leaf buds are so changed, and so large an amount of nourishment stored that a tree has been known, the following spring, without the action of the roots, to produce leaves and a full crop of fruit to more than half their natural size.

We have experimented with apricot trees by keeping their roots frozen so late in the spring that many of their leaves were fully grown, and the fruit had acquired more than half its natural size. Similar examples might be cited. For instance, grapevines have been planted in open borders and afterwards passed through the walls to the inside of a conservatory in which fires were kept up. Such vines have produced both leaves and fruit of considerable size, while the border, in which the roots were, was yet frozen.

It is wholly within our means to prevent overbearing or barrenness in trees. And he who is ambitious to grow fruit of first quality, or to the most profit, should thoroughly understand the peculiar habits of each variety and

the method by which both barren or alternate year bearers may be made to yield a full annual crop of fruit.

To understand this we must refer to the trees active in growth. Trees which expend all their forces in the production of wood growth can produce little or no fruit. Indeed, it is not possible for any tree to perfect a fruit-germ and not again in some way disorganize it, unless the wood growth shall cease in time for the leaves to elaborate food enough to grow both leaf and fruit the following year, or until a part of the leaves shall attain to nearly or quite their full size. That this is so will be apparent when we consider that the leaves, which first appear in the spring, were formed in the buds the previous year, perfect in all their parts, and in the embryo state contained each individual cell found in them when fully grown. But we are asked, if there is no addition to the number of cells, how do the leaves grow? The answer is, that the only difference we can see between an embryo leaf and one full grown is in the size of the leaf cells. As growth begins in the spring, these small cells, which were formed in the previous year, begin to expand. Each individual cell thus enlarges until the whole of the numerous cells of which the leaves are composed are of full size.

To further illustrate this, let us suppose in a brick wall that each brick at the same time was gradually to expand several hundred times its present diameter, and you have just what takes place in the growth of an embryo leaf. Here we find the tree in possession of a full grown leaf. This leaf did not form itself, but was formed by the tree in the preceding year. To produce and sustain this cellular enlargement there had been stored the previous year a large share of nutriment in the buds and in other parts of the tree; this nutriment or plant food must not only be sufficient to feed the embryo leaves, but must also be sufficient to produce the small warty excrescences, the rootlets and spongioles. These new leaves and spongioles are the tree's laboratory. And those leaves and spongioles first grown were made, with the exception of moisture, wholly out of the materials that were stored by the tree during the growth of the previous year. When these vegetable stores are in sufficient supply to do this, and nourish the fruit-germs also, then we shall hear little about imperfect fertilization. On the other hand, had the food been consumed the previous year by ripening an overcrop of fruit, or by making a very succulent growth, then the tree would not store a sufficient amount of plant food to perform its threefold office in the production of leaves, roots, with their spongioles, and fruit. In this condition a part of the leaf, and the larger part or all of the fruit buds, yield up their nourishment, which goes to the production of root and leaf growth. The tree, therefore, is barren of fruit for the summer, its whole growth being required to recuperate the vigor of the tree. Such trees often bloom freely and cast their bloom. When this occurs uninformed persons often attribute this to want of fertilization, or suppose that the rains have washed away the pollen, and the like.

Having thus hastily referred to some of the causes of our fruit production and wood growth, we will now return and state, first, how we treat trees bearing alternate crops, and second, how to bring unproductive trees into

fruit. First, then, alternate bearing trees are such for the reason we have endeavored to explain, viz: exhaustion. What we have to do, then, is to economize and equalize the forces of the tree. If it be a Heart or Bigarreau cherry on which we are to operate, our first duty will be an inspection of the buds, that we may know what proportion of them is perfect. But before we proceed we will have to state that the fruit buds on most cherries are produced on little spurs, as they are called; these are two, three and four years in forming. Each of these will likely have five, ten or more fruit buds, and each bud will contain several fruit-germs. When all the germs were perfect, we have known as many as sixty fruits produced from a single spur, when not more than a dozen or fifteen could be properly grown.

Understanding as we now do the position of the buds on the cherry tree, we next determine their condition by an inspection of them, as detailed in our remarks on buds. Probably we shall agree, for a tree of which the diameter of the trunk is four inches, one-half bushel of fruit may be reasonably looked for, and for each additional inch in diameter four quarts may be added. Now let us further agree on the number of cherries required to fill a half bushel. As our way will double and perhaps triple the size of the leaves, the fruit will be correspondingly large. Hence we reduce the usual number five thousand to eighteen hundred, to fill the measure. Next, we estimate our buds, so many to each spur—five will be about right. Now each of these buds ought to yield three cherries, fifteen to each spur; we shall need, then, only one hundred and twenty such spurs, but we will allow a few, and say one hundred and thirty, to provide the required amount. This determined, some time before the buds open in the spring we prune away all the spurs except the requisite number, leaving those that are to remain evenly distributed throughout the tree. In addition to the spurs already formed there will be a great number of small one year old spurs developing for fruit for the next and succeeding years. Each year thin these out, always leaving as many again as you ultimately expect to reserve for fruit bearing, as some of them, under the treatment we have described, are pretty sure to run off into wood growth. Alternate bearing trees managed in this way cannot overbear one year, and hence will not require a whole year's rest in which to restore their exhausted energies, as would be the case had the trees received the ordinary treatment.

We now come to the second class, or trees of great vigor of growth that show but little or no fruit, of which, among cherries, Napoleon Bigarreau is a good example. For a long time both cherry and pear blooms greatly puzzled us. It was easy to know that no tree could bear fruit without bloom, but it was not so easy to assign a scientific cause why vigorous trees, in full bloom, should produce none. But after repeated microscopic examinations of fruit-germs taken from trees that had made luxuriant growth, we determined the cause to be due solely to imperfect organization of the fruit-germs, superinduced by want of nourishment. This, then, we suppose to be the condition of a barren cherry tree which we now propose to bring into full bearing. Trees that show great vigor of growth produce a great excess of large and small branches. We will then first prune off this excess of growth so as

to fully expose what is left. Next, with a sharp spade, we open a trench as deep as the lateral roots penetrate, and quite around the tree, cutting off all the roots. We vary the operation according to the habit of the tree, so as to cut off what we estimate to be from one-third to two thirds of all the root growth. Having finished the operation of shortening the roots, we fill the trench and give thorough cultivation to near the end of the season.

Peaches and nectarines have sported into many varieties, and of each there are early and late. For instance, the Hale's Early peach, at Alton, ripens about July 28, and the Heath cling at least six weeks later. Why the long interval in the ripening of the two fruits? With our present knowledge we cannot explain further than state that, on trees of the same age and under similar treatment, early and late kinds all bloom at precisely the same time; or, if any variation as to time of blooming occurs, it will as often happen to one sort as the other. Therefore, the statement so often made, in the spring after severe frosts, that the buds of early peaches must be killed, has no force.

Another fact in relation to this fruit that we do not recollect to have seen noticed, is that all varieties, early, medium and late, grow alike at first, all at the same time reach the point at which the stoning or hardening of the pit commences; from this time, until the stoning process is perfected, the peach does not enlarge; therefore, the only difference in the time required to mature varieties must depend solely on the time required to harden the pits. There are yet other points to which we desire to direct attention. Varieties of both peaches and nectarines are divided into three separate classes, founded on certain characteristic markings on the leaves. First, varieties with globose glands; second, reniform glands; third, those whose leaves are deeply serrated without glands.

Glandless varieties are subject to mildew in the branches, in the leaves and in the fruit, in so marked a degree as of late to be wholly worthless. In selecting varieties to plant, this fact should not be lost sight of. Why it is that mildew most affects this class, in the way we have stated, is a point on which we earnestly desire light. Can any one tell us the office of the leaf glands?

Pruning the peach is probably not correctly performed by a dozen persons in the country. We have visited hundreds of orchards, west and east, in not one of which was there the least evidence that a correct theory had guided the hand in performing this important operation. It is singular what a hold false theories will take on the minds of men when disseminated by high authority; and perhaps none have worked more harm than those which relate to pruning the peach. We can no more teach this specialty on paper than we could anatomy.

Yet we can state some of the theories that must be recognized to insure complete success. First, and the most important of all, is a recognition of what we term true fruit leaves.*

---

* This term is arbitrary, but answers our purpose.

We have already mentioned that a certain portion of the leaves, as well as fruit, was made out of the food stored in the tree the previous year. We have often queried, when reading learned dissertations on pruning, if this fact was had in mind, or whether it had ever occurred to the authors that the leaves of later growth, as well as the fruit from the time of stoning, were grown by those leaves that wintered in the bud. Leaves do not create themselves, but are in the main made by other leaves; hence every facility should be given to these first leaves to perfect themselves without much competition of leaves of later growth. We have demonstrated by repeated experiments that the fruit on any twig or branch will correspond to the size of the first leaves. Hence our term fruit leaves. We now see the importance of large leaves, and our next step will be to secure them. This we do first by thinning out such large branches as should be removed; then cut back to some small branch or shoot which points in the right direction, those that are extending too far or are likely to become pendant under the weight of fruit. Having done this, we next estimate the capacity of the tree for fruit bearing. For a tree six or seven years old, six one-third bushel boxes will not be too many. To fill these we allow forty-eight peaches to the box. If we allow two peaches to each twig, we shall require two hundred and eighty-eight such twigs. Cut away all others, except where new branches are desired. Many of these small twigs, or last year's shoots, on which the fruit is borne, will often have from ten to twenty, or more, young peaches, leave these until they are as large as a hazel nut, then reduce from one to three to each branch according to strength.

Before we close our remarks on the peach we will refer to a new difficulty attending its cultivation, mention of which we do not recollect to have seen. As soon as peaches are as large as a pea, a snout-beetle makes a small round hole, reaching quite down to the pit, or into the kernel, on which it deposits an egg; this egg soon hatches, producing a small white larva. The fruit drops to the ground soon after the egg is hatched.

We have often noticed these small fallen fruits, without, until recently, understanding the cause. So small is the round puncture made, by means of which the pit is reached, that it escapes notice unless the downy substance covering the peach is removed. We believe that the operations of this insect do not extend beyond six or ten days. As soon as the fleshy parts of the peach thicken so they cannot reach the pit, their depredations wholly cease. Can it be that the mischief is done by the Plum Gouger, of Walsh, or has some one of the numerous nut-beetles left its legitimate calling for the more genial pursuits of horticulture?

APPLES.

Until within a few years the apple was grown almost without care. Of late, however, so numerous are its diseases and insect enemies, that in some districts its culture is no longer attended with success. And unless we combine our efforts against its insect enemies we must wholly abandon its culture, or be contented to feast on the few wormy and knotty specimens which reach maturity.

So rapid has been the increase of the plum curculio and the apple curculio that in some districts these two insects, or even the plum curculio alone, are in sufficient force to totally ruin the apple crop. Hereafter, so far as we can now see, no escape from the ravages of these insects need be looked for, except by united effort in their destruction. So numerous have curculios become in our own grounds and surroundings, that for the past two years our Janet apples have been destroyed, and other varieties made worthless, except for cider. In the future we shall have to bestow the same care in catching curculios on our apple that we do on our plum trees. Except in very early apples, the larvæ of the plum curculio do not perfect themselves, but the parts wounded by them furnish resting places for fungi, where it multiplies and spreads to all parts of the orchard. Horticulturists must recognize the fact that as we increase the production of any fruit, we at the same time increase its peculiar insects and diseases.

PLUMS.

Thus far we have devoted no remarks specially to the plum, nor would we further trespass on your time were it not probable that some varieties of this fruit may be grown to a profit in all parts of the State, doubtless, in many parts, with far less care than will hereafter have to be bestowed on the apple.

In this country the curculio has so long held undisputed dominion over the plum that a knowledge of the varieties of plums has passed out of mind. We shall therefore refer to some of the best, that those who desire to enter the field against the "little Turk" may have fruit in quantity and of a quality to reward them for their labors.

For a single variety, for family and for market, we place the Jefferson at the head of the list. Three best for family, to ripen in succession, add Washington and Coe's Golden Drop. Four best, add Smith's Orleans. Five best, add Imperial Gage. Columbia is a desirable sort to plant in apple, pear and peach orchards, on which to catch curculios. The curculios would be attracted to these trees when in fruit, where they might be caught. The Columbia plum generally discharges so much juice into the passage made by the larvæ of the plum curculio as to drown them. On this account it is that we recommend it as a protection to our orchards.

River's No. 1 is one of the earliest plums with which we are acquainted. It bears moderate crops annually.

Dominie Dull.—Since the prevalence of the peach rot this and the following were the only sorts that have wholly escaped rotting.

Ghiston's Early.—Tree grows slowly, very productive, quality good to very good.

Lombard.—Tree a moderate grower, alternate bearer, quality only good. We should have omitted the mention of this variety had not an impression obtained that it was curculio proof; perhaps no sort is more preferred by the curculio.

Diamond.—One of the most productive and showy plums, of first quality for cooking, but too harsh for the desert.

Reine Claude d'Bavay, McLaughlin and Red Gage are good plums for the table, and may also be grown, to a limited extent, for market.

DISCUSSION.

Mr. H. C. FREEMAN—Do I understand Dr. Hull to say that fruit buds may be changed into leaf buds?

Dr. HULL—Yes. A vigorous growing shoot has the power to push into a leaf, starving out the fruit-germ.

Mr. FREEMAN—The practical inference then is, that, in the operation of budding you need not be particular what kind of a bud you take.

Dr. WARDER—It is always safer to put in a leaf bud.

Mr. FREEMAN—Mr. Pullim, of Centralia, informs me that many of the buds seeming to be leaf buds are really developed into fruit buds. He says it is difficult to tell the difference until they blossom.

Mr. MINER—What is the proper time to trim the peach tree?

Dr. HULL—Any time after the fall of the leaf.

Mr. MINER—Can you trim safely when the tree is frozen?

Dr. HULL—You can prune any time in the winter. If the limbs are frozen you must take care not to bend them. It is the bending of the limbs when frozen that does the injury.

Mr. WRIGHT—I would like some information in regard to growing the peach tree. I find, in this portion of the country, we have no peach trees. They are generally destroyed by this worm at the root of the tree. I don't know what it is called. I have bought trees two years old infested with this white worm. It seems to me useless to try to grow peaches unless we can kill this worst enemy of the tree. I do not believe there is a tree within five miles of this place that is not injured by this grub.

Prof. STEWART—I remember a case where a woman scalded the tree at the roots, and she never before had such an abundant crop.

Mr. M. L. DUNLAP—I knew a similar case in the city of St. Louis; the party scalding the tree for the purpose of killing it, but the tree received the seeming harsh treatment kindly and bore an abundant crop.

Mr. N. J. COLMAN, of St. Louis—I have heard the story of pouring on the hot water, but I heard it as happening in South Carolina. [Laughter.] I know that Edward Bates knew it tried in South Carolina. I have known other parties to locate the story in Virginia. It is immaterial, however, where it is located. You

will hardly be able to make water too hot for the grub; the only way to get him out of the tree is to bore him out. Some mound up trees six or eight inches. That practice is quite extensive in Southern Illinois. But the remedy is as we have stated. He who would grow peaches must go for the borer with a sharp stick. I have an orchard of eight thousand trees, and depend on nothing else. I know that Dr. Hull advises planting the peach tree deep in the ground—from four to six inches. I do not know whether this answers the purpose or not.

Dr. HULL—It does.

Mr. COLMAN—Upon the subject of high or low trimming I will say I do not expect to see our prairie farmers adopt the high trimming system. I have seen a great many orchards in Missouri, and the best orchards I have seen are those with low tops. It is true you cannot get under them to cultivate, and it is not desirable to do so. I am inclined to think low heads the best, say three or four feet. That would be my plan, and the further north I went I would go correspondingly lower.

Dr. HULL—When I said that low heads were a failure I made the statement from careful observation. What are the facts in the case? Take the fruit district from Centralia to Cobden. These orchards are all failures! Their failure amounts to millions of dollars for that one district alone. Twenty-three years ago I planted trees with low heads, and I raised good fruit. By-and-by others began to plant orchards and to grow fruit and *curculios*. I discovered the danger just in time to save myself. I had constructed a curculio catcher, and I must from necessity get it under the trees, and for this purpose, among others, I began to change from low heads to high heads, and I think the result has justified my conclusions in recommending high heads. We should remember that the conditions of fruit growing are changed from what they were years ago, when some of us commenced in this business. We should look this fact in the face and shape our practice to meet the necessities of the time. It is a hopeless task for me to plant an orchard with low heads and expect to gather fruit from it.

Mr. M. L. DUNLAP—About this peach grub. I find that he will not pay any attention to your patent remedies. He must be dug out. Smiley Shepherd told me that he tried planting tansy, which was recommended to keep out the borer, but he found the tansy

was worse than the grub! [Laughter.] The knife is the sure and best remedy. This remedy, faithfully applied, will not fail. Try it. In regard to the codling moth, we can use Dr. Trimble's bands of hay or straw, placed around the trunk of the tree. Examine the band frequently and catch the worms.

Dr. HULL—I would like to hear Mr. Dunlap on the subject of high tops.

Mr. M. L. DUNLAP—I differ as to the height of the tree in part. Or rather I would adopt a modified system, between the high and the low. The high winds on our prairie orchards are a serious obstacle to growing high headed trees. On the other hand, we must provide for catching the insects. I would say trim your tree to two feet in height, and then let the heading of the tree commence. This will give room to run the curculio catcher.

Dr. HULL—Many are deceived as to the presence of the curculio in their orchards. I have examined trees supposed to be exempt and found them in abundance. In my plum orchard I go through the ground about three times. The curculio does not fly at a temperature of 70 degrees, but does fly at a temperature of 80 degrees. It is almost impossible to protect an orchard in the vicinity of other orchards unless there is a systematic warfare waged against these insect enemies. But if my neighbors wont work I must work the harder. I cannot use the catcher to advantage under trees headed only two or three feet high, hence I trim higher.

Mr. RICE—At what time do you commence to catch the curculio?

Dr. HULL—From the first to the fifteenth of May.

Mr. RICE described an insect that had troubled his plums and peaches, said he had never seen anything like it before, and wished to know what it was.

Dr. HULL—It is probably the plum gougher, of Dr. Walsh. It attacks the fruit and lays its egg next to the pit of the peach.

Mr. ROBINSON recommended the practice of mounding up around the trees with hard clay, to prevent the peach borer from depositing its egg. He had known this practice prove beneficial.

Dr. HULL—My observation is that the peach borer lays its eggs six inches below the surface of the ground, and below the collar of the tree.

A VOICE—How many years since the borer first made his appearance?

Mr. ROBINSON—I saw them ten years ago.

Mr. WRIGHT—It is the opinion of some that they made their appearance about the time Mr. Dunlap came to this country. [Laughter.] I look upon this as the most serious thing connected with peach growing. The remedy proposed for the grub is death in time to the tree. I had a few trees in my yard and had grubs in them. I went at them with a "sharp stick," and kept digging at the trees and killing grubs, and about the time I had succeeded in killing the grubs I had killed the peach trees. So it seems to me that if Mr. Dunlap's method of getting rid of the grub is the only remedy, I think we may as well cease to try to grow peaches. If you will tell me some method to kill the grub, I will insure a peach crop at least every other year.

Mr. FREEMAN—I wish to inquire in reference to the loss of the quince crop. I have attributed it to a beetle that destroys the blossom.

D. HULL—They fail simply because they are not fertilized.

Mr. EDWARDS—I am perfectly well satisfied that if success in the cultivation of fruits is to attend our efforts, we have got to work for it. I believe we have got to have good industrious Adams and Eves in the garden, to "keep it." It is high time that every one of us understood that "eternal vigilance" only will guard our fruits.

Mr. EDWARDS asked Mr. Dunlap to explain Dr. Trimble's method of catching the codling moth.

Mr. M. L. DUNLAP—Dr. Trimble's method of catching this moth is to make a band of hay and bind it around the tree. The insect spins its cocoons under the band, where you can easily catch and destroy them.

QUESTION—At what time do you bind this on the tree?

ANSWER—About the middle of May, and leave it on till the last of June.

Dr. WARDER—I would say, put on in the spring and take off in the fall. I am more and more satisfied that we ought all to subscribe for the Entomologist, published in St. Louis, and edited by our much esteemed friends Dr. Walsh and C. V. Riley.

A VOICE—Who is the agent?

Dr. WARDER—I am. [Laughter.]

GRAPES.

A LECTURE BY HON. GEORGE HUSMANN, OF HERMANN, MO.

"The old has passed away, and all things have become new."

In these days of railroads, of telegraphs, and of machinery, when space and time are almost annulled, a great revolution is silently, quietly, but for that reason, perhaps, all the more powerfully working its way through all classes of society, through every branch of industry, in the accoutrements of war, as well as in the graceful arts. Mankind travels with railroad speed in thought as well as in action; and in no country, perhaps, is this more true than in ours. We are a fast people, perhaps too fast in some things; but it is characteristic of the nation that we take hold of everything we undertake with an energy which is really startling to other nations. Young America is a giant, uncouth sometimes, perhaps, but with a vein of good common sense running through all he undertakes, and generally with a shrewd eye upon the almighty dollar.

That this is eminently true of American Grape Culture I hope to demonstrate to you in the course of the following remarks.

Only short twenty years ago, Cincinnati and the banks of the Ohio river were almost the only location in the country at all noted for grape culture. If beginnings had been made in other locations, they were not yet important enough to be worthy of universal notice. Now, the whole country, from the Atlantic to the Pacific, is alive to the importance of grape culture; and there is hardly a locality, even at the extreme north, where some varieties of the grape are not now grown successfully. Then, only one variety was considered valuable as a wine grape, the Catawba; now, we count them by hundreds, to which every day still adds further. Then, about two hundred and fifty gallons of wine to the acre was thought a large average yield; now, we are not satisfied unless we average from six hundred to twelve hundred gallons, and the crude attempts at wine making of those bygone days, and their products, would make but a sorry show by the side of our Cythiana, Norton's, Hebermont, Delaware and Taylor wines of to-day; wines with which we can safely challenge the choicest vintages of Portugal, France, Burgundy and Germany. Then, we were entirely dependent on the seasons in the produce of our vineyards and the quality of our wines; now, the science of Gall, Petiot, Captal and Frings has come to our aid, and we can count with mathematic certainty upon having good wines always and in every season.

But it is not alone in the quantity and quality of our wines and grapes that we have improved. We have also learned to grow them with much less labor. Instead of laboriously and slowly trenching the soil with the spade to the depth of two to three feet, and burying the genial surface soil beneath the subsoil; instead of reversing the order of nature, we have become convinced that the grape vine, the most sun loving of all plants, flourishes better if the soil is left in its natural position. Where formerly the slow work of trenching and reversing the soil cost from one hundred and fifty to two hundred

dollars per acre, we now take the plow and subsoil plow and prepare an acre in a day, at a cost of about twelve to fifteen dollars. When formerly the vines were trained to stakes in the old slovenly manner, which took an acre of timbered land to supply the stakes for an acre of vines, we now make our light wire trellis, with a post every twenty feet, with half the cost and half the labor in tieing and pruning. Formerly the vines were not summer pruned until long after blossoming, when they had become one tangled mass of shoots and tendrils, and the knife, and very often the sickle, was resorted to cut the Gordian knot, slashing and maiming the shoots, and denuding the fruit, thereby causing stagnation of sap, sun-scald, and nearly all the evils to which grapes are subject. Now, we have learned to summer prune with the thumb and finger, thereby only gently checking the undue exuberance of growth, leading it into its proper channels, and simplifying the whole course of management, so that every boy and girl of ordinary mental capacity can now do the work in their father's vineyard. And last, but by no means least, we are growing thousands of pounds of grapes now, where there was one grown twenty years ago. The noble grape, the healthiest and most luscious of God's fruits, is no longer the rich man's luxury, but is within the reach of all.

There is no laborer so poor but he can now grow or buy grapes for his wife and children, so that it has become a *universal* fruit. And what is more, where one gallon of wine was made twenty years ago, tens of thousands are made now, and we are on the road to become a temperate people. For, my friends, every wine maker among you is an apostle of temperance; and if you produce that most innocent, healthful and inspiriting of all stimulants good pure wine, thereby supplanting those abominable poisonous compounds which are now palmed off on the public as brandy and whisky, you do more for the cause of true temperance than Gough and all the total abstinence lecturers in the country. Is it not an insult to a *free* nation to try and fetter it by Maine liquor laws, to try to force people to behave like decent beings, and to forbid them to become beasts!

Look at wine-growing districts of other countries. Wine is there the every day drink of the laboring classes, and yet drunkenness is of very rare occurrence. And then look at our country, look at England, Ireland, Scotland! What do you see? Pictures of misery and degradation everywhere; the image of God transformed into a hideous mockery, family ruin and strife, neglected children, deserted wives. And have so-called temperance laws proved efficient against this? Quite the reverse. Man is so constituted that he will have a hankering after forbidden fruit. Say to him "touch not," and many who would not perhaps have thought of it before, will now try to get a taste of it, find it sweet because it is forbidden, and indulge oftener. It is an insult to manhood, in this, the freest of all countries, to try and shackle the will of man by law. Punish disorderly conduct and drunkenness as severely as you please, treat the drunkard as what he is, a nuisance to society, but do not say to the sober, industrious laborer, "Thou shalt not refresh thyself with a glass of good wine when thy muscles relax from severe toil, when thy tongue is parched with thirst, because thy neighbor makes a beast of himself by drinking whisky and brandy to excess."

This, my friends, is the noblest mission of American Grape Culture. Let us offer a glass of good light wine, at a low price, to every laborer in the land, to cheer him on and invigorate him at his toil. He needs it more than the rich epicure at his well spread board, with every luxury at his command. And we can do it. We can grow and make good drinkable wine at seventy-five cents per gallon, and when it comes down to that, or even a dollar per gallon, its consumption will increase to a degree which will astonish those who are now afraid that the thing will be overdone, and the market glutted.

We do not need a single drop of European wine in this country; we can grow all that is consumed here, and we can, and will, *export* American wines. We have proved already, in these short twenty years, that we can produce wines equal to the best of other countries. Where is the Burgundy equal to or better than our Cynthiana and Norton's? Where the Claret better than our Creveling, Clinton and Concord? Where the Rhenish wine with which our Delaware, Taylor, Hebermont and Cassady need fear comparison? And where is a better Sherry than our Rulander and Hermann? I have tasted wines from all countries, at fabulous prices, but I predict to you here to-day, and I wish you to make a note of it, that in twenty years more we will rival and surpass them all.

American Grape Culture is only in its infancy; the young giant is hardly awake, but he begins to see daylight, and when the child becomes a man he will fill the land, and we will make wines so good and so cheap that we can abolish the protective tariff and still drive foreign wines from the market with our native produce. May we all live to see that day.

But, my friends, these are only generalities. I have tried to show you that the new era in American Grape Culture has commenced, that "the old has passed away, and all things have become new." But, myself a farmer, I speak to farmers, and I know that they are practical men. Generalities will not suffice with them, they must be shown the why and wherefore, they want facts to convince them. If, therefore, you wish information upon any point, I would rather it should come in the shape of questions from you and answers from me; and you can rest assured that the answers will be candid, straight forward and explicit, to the best of my ability. My knowledge is but limited, but while I do not pretend to be an authority, I acknowledge none, and have no secrets, for we all seek the truth, and should gladly impart what little knowledge we may have gained to our fellow laborers.

DISCUSSION.

Mr. EDWARDS—I wish to inquire of the lecturer if it is his opinion that our clay subsoils should be underdrained?

Mr. HUSMANN—I would like to inquire if the subsoil is very tenacious?

Mr. EDWARDS—Not generally very tenacious.

Mr. HUSMANN—Does it hold water in any considerable degree?

Mr. EDWARDS—Not like hard pan. In wet seasons, however, it retains a considerable amount of water.

Mr. HUSMANN—I should think it would be necessary, and certainly desirable, that such soil should be drained. My experience leads me to think that all the varieties belonging to the class of grapes called Labrusca require a richer soil than the class Æstivalis. There are exceptions to this rule.

A VOICE—State the characteristics or types of the two classes.

Mr. HUSMANN—The Catawba, Concord and Hartford Prolific are types of the Labrusca class. The Æstivalis is the common summer grape in our woods. The Norton's Virginia, the Cythiana, the Hebermont, are types of this class of grapes.

QUESTION—Where do you class the Delaware?

Mr. HUSMANN—It comes in the class Æstivalis.

QUESTION—Where do you place the Isabella?

Mr. HUSMANN—It is Labrusca.

QUESTION—Where do you place the Hebermont?

Mr. HUSMANN—Æstivalis.

Mr. B. F. JOHNSON, of Champaign—We have, I believe, two kinds of wild grapes.

A VOICE—What are they good for?

Mr. HUSMANN—Not much, so far as we have tried them.

Mr. CAMPBELL—At what distance would you plant the Concord?

Mr. HUSMANN—6 by 10.

QUESTION—Do you protect the Norton's Virginia in winter?

Mr. HUSMANN—I do not.

QUESTION—Is the Ive's Seedling as early as the Concord?

Mr. HUSMANN—I think so.

QUESTION—What are the particular varieties that you would recommend for general planting?

Mr. HORSMANN—I would plant the Norton, Cynthiana, Maxatawy, Clinton, Hartford Prolific, and some of Rodger's Hybreds, say Numbers 1, 3, 4, 8, 9 and 22.

QUESTION—What number is the Salem?

Mr. HUSMANN—No. 22.

In answer to a question, Mr. Husmann stated that many varieties of grapes had a tendency to overbear, and this favored disease, mildew, etc. The Delaware would do this until we trimmed it very short.

Mr. B. F. Johnson—What is the best aspect?

Mr. Husmann—We take a southern slope where we wish to grow grapes for the purpose of making the best wines.

Question—Is it not considered that the fruit that ripens under the sun of the first half of the day is better than that with the last half.

Mr. Husmann—We do not find it so.

Question—Do you renew your wood as often as possible?

Mr. Husmann—Yes, in the case of some varieties.

A voice—Will you give your system of pruning.

Mr. Husmann—We modify the system according to the variety.

It was suggested that he take the Concord, and show his method of training the grape. Mr. Husmann here went to the blackboard and demonstrated his method of pruning the Concord vine. He fruits this variety mainly upon the laterals. He explained the practice of summer pruning, first and second pinchings.

Mr. Jewett—When would you make this second pruning?

Mr. Husmann—Just as soon as the shoots become long enough in the summer. Indeed, I don't know that I have a great deal of system in pruning; I go to work and prune just as I please. With the Catawba, in particular, we practice the renewal system.

Mr. Campbell—What height do you make your trellisses?

Mr. Husmann—Five feet.

Mr. Campbell—Do you use wires?

Answer—Yes.

Quesiton—How many?

Mr. Husmann—Three.

Mr. Husmann said, in answer to a question, we change our treatment, as I have stated, with the variety we have to deal with. The Norton's Virginia fruits better upon old wood; so does the Taylor, and also the Clinton. We fruit these varieties on spurs.

Mr. N. J. Colman—What is the best variety to succeed the Concord?

Mr. Husmann—I think Rodger's No. 4 the best.

Mr. Campbell—Is it as hardy as the Concord?

Mr. Husmann—It is hardy enough for us.

Mr. B. F. Johnson—What is your soil? What its geological formation?

Mr. Husmann—It is a sandy clay subsoil, overlaid with a black loam, and underlaid with sandstone.

QUESTION—Is it good grain land?

ANSWER—Yes.

QUESTION—Do you manure your vineyard?

ANSWER—Very seldom.

QUESTION—Are animal manures injurious?

Mr. HUSMANN—Good native soil is the best manure.

QUESTION—Are bones good manure for grapes?

Mr. HUSMANN—They are, but we can't get enough of them.

Mr. CAMPBELL—Do you plant anything in your vineyard?

Mr. HUSMANN—Sometimes we plant potatoes, but not too near the vine.

Mr. CAMPBELL—Do you ever seed the ground down and leave it?

Mr. HUSMANN—No, sir.

Mr. CAMPBELL—How late do you cultivate?

Mr. HUSMANN—I cultivate all through the spring and summer, late and early.

Mr. CAMPBELL—With the one-horse cultivator?

Mr. HUSMANN—Formerly I used the cultivator, but now I use the single-horse plow.

QUESTION—Do you not disturb the roots?

Mr. HUSMANN—I do not.

QUESTION—Is it any injury if you do break the surface roots?

Mr. HUSMANN—I think it is not.

QUESTION—Do you mulch?

Mr. HUSMANN—No, sir; it is better to stir the soil.

Mr. N. J. COLMAN—How deep do you plant your vines?

Mr. HUSMANN—I try to put my vines about ten inches below the surface. I do not wish to force my vines to go down.

QUESTION—What grapes are best to preserve for winter use?

Mr. HUSMANN—We generally preserve them in a liquid form. [Laughter.]

A VOICE—Perhaps the gentleman means to ask what grapes will keep the longest.

Mr. HUSMANN—Yes, I understand the question.

Mr. N. J. COLMAN—Do you have to shoot the birds?

Mr. HUSMANN—We shoot some, now and then.

Mr. COLMAN—Do they damage your crop of grapes?

Mr. HUSMANN—Yes; they have damaged us a great deal this season.

QUESTION—I wish to ask if you have ever tried Fuller's system of training?

Mr. HUSMANN—Yes, I have tried it. It is a very pretty looking system put on paper. Paper is very patient, but the vine is not always so patient; it is sometimes positively obstinate. This is the difficulty in the system.

In regard to the quality of wines, Mr. Husmann stated: We distinguish between aroma and bouquet. Bouquet is the product of the action of the air upon the juices of the grape, or acids contained in the grape. One may have a great deal of aroma and very little of bouquet, and vice versa. If we gather our grapes early, when they contain a great deal of acid, we shall have more bouquet and less aroma. If we want bouquet we gather our grapes before they are fully ripe.

A VOICE—The Concord makes the best wine, with the addition of sugar, does it not?

Mr. HUSMANN—There is no accounting for taste. Some people prefer this and some prefer that. Grape growers in Germany have pure good wines, for the reason that they are careful to pick out all imperfect berries.

Mr. N. J. COLMAN—What quantity of water and sugar is used in the manufacture of wine?

Mr. HUSMANN—That depends upon how heavy the must is. Take the Catawba, that will weigh 85, we use two pounds sugar to one gallon of water.

QUESTION—Have we any grapes adapted to making raisins?

Mr. HUSMANN—I do not think we have a raisin grape.

Dr. WARDER—We have no raisin grape in this country. There are three classes of grapes—

1. The American grape, represented by the Fox grape, called the Pulp grape. Everybody knows it.

2. The Juice grape.

3. The Flesh grape.

This last class of grapes, the flesh grapes, is the only kind of grapes suitable for making raisins.

Mr. COLMAN—From what grapes do they make raisins?

Dr. WARDER—I do not know the names of the grapes. I suppose, however, they make raisins from the Malaga grape.

Mr. M. L. DUNLAP—They have at Alton a system of pruning the grape vine. I wish to call upon Dr. Hull to give us some information upon this subject.

Dr. HULL—The system is a very simple one. I wish to refer to the diagram on the blackboard, for illustration. This system of pruning was devised on recognizing the fact that particular leaves have certain functions to perform, and that these leaves are best adapted to bring the grape to perfection. Now what we have to do is to keep these leaves perfectly healthy, and not to admit of competition. Our plan gives us eight leaves. [Reference was made to the diagram, and minute description given.] The plan is to twist the cane around a stake, so as to throw all the buds outward, and when the laterals have pushed out at sufficient length they are pinched one leaf beyond the last bunch of grapes. A second pinching is made, when the vine is left to itself. About ten buds are left to each cane, and but one bearing cane to the vine. This twisting of the vine will cause the buds to burst evenly, and this keeping the leaves fully exposed, and not crowding them, will double their size and improve the size and quality of the fruit.

DR. WARDER'S LECTURE ON PROPAGATION.

Seeds and buds are the basis of propagation. The distinction between them has already been explained. We also propagate by other methods than by seed or bud. We propagate by layers, where a portion of the plant is brought in contact with the earth. We propagate by *stolons*. The strawberry is an example. Runners are thrown out, and the plants rapidly multiply. Plants produced by stolons will be like the parent plant. There may be occasional departures from this rule, but these are rare exceptions.

We have another means of propagating, and that is by suckers. These are simply shoots starting up from the roots of plants, as in the case of some varieties of the raspberry, which are to be separated from the parent plant. There is another method of propagating. I refer to propagation by *corms*. Take the strawberry plant—the woody portions of the plant—and you will find points of growth in it, so that the corm may be divided into as many divisions as there are points of growth.

Propagation by tubers is another method. Still another way is by root cuttings. These are analogous to propagation by suckers. The propagation by means of root cutting is a sort of artificial suckering.

At the present time we will take up the idea of propagation from seeds. This is the common method of propagating where mere stocks are wanted. We also use this method when we wish to get new varieties. You will remember that I told you upon a previous occasion that seeds were used to multiply the species, and the buds to multiply the individual variety. Now the first consideration respecting seeds is their vitality. There is a great difference in the degree of vitality in seeds. Some will retain for a long time

the vital principle, others very soon loose this vitality. It is stated, with a good degree of evidence, that the raspberry will retain its vitality for one hundred years.

As a rule, seeds upon separation frqm the pulp should be dried and kept perfectly dry. Take the apple or pear seed, if not kept dry and at a proper temperature, there appears a fungus growth among them, which destroys their vitality. As soon as fermentation takes place the life of the seed is gone Seeds, even when well dried, should not be put away in large bulk together. It is safe to put apple and pear seeds in sand, and it is safer not to wet the sand until just before planting, and when wet they must be kept in such a temperature as not to germinate. Some freeze them. This will do, providing you keep them sufficiently cool till planting time.

It is best to plant in the spring. The chief reason is, we avoid the trespasses of little animals that destroy them. The seeds of the raspberry and strawberry are mashed out from the fruit, and as soon as dry rubbed with sand. Wash and dry them again, or sun at once. It is safer to sun in boxes. They may be made to germinate at once and fruit the next year. I have eaten strawberries in eleven months from the sowing. Currents and gooseberries treat in the same way.

Now we come to consider the seeds of the stone fruits—the cherry, peach, and plum. The cherry, being a small seed, is apt to become dry. The seeds of stone fruits are exposed to the frost of winter for the development of the germ, when they are planted in the usual way. Some plant the seeds directly in the place where they are to remain. Others, again, allow them to grow in a bed for a while and then take them up and plant as you would cabbage plants. This practice is adopted more especially in the case of plums and peaches. The same practice is pursued in planting timber. In the case of oaks, it is better that acorns be gathered in the fall and placed in a moist soil, favorable for germinating in the spring.

But we come back to the seed-bed. The seed-bed should be good soil, finely pulverized, when it is ready to receive the precious germs. But the depth to which you plant is important. We estimate that seeds planted twenty times deeper than the diameter of the seed will fail to vegetate. Seed should be planted at an average depth of from half an inch to two inches. That will be deep enough.

With regard to the time of planting. This will depend upon the condition of the soil. If we wish to avoid loss we had better plant in the fall. Still the majority of persons plant in the spring. Some question as how to plant these seeds, whether with a drill or otherwise. The speaker favored the use of the drill. The wheat drill could be used in planting many crops by stopping up every other drill, or such portion of them as may be required to give the needed space to the rows. But in whatever way the seed is dropped, it is desirable to have it properly covered. The method of some is to cover with the foot, a very simple and effectual method where the soil is sufficiently mellow. Another way is to take a rake and cover the seed, or it may be with a hoe. Any method that covers the seed with finely pulverized

soil from half an inch to two inches, according to the size of the seed, is effectual and satisfactory.

It takes some time for the seed to vegetate. This is especially so in cold ground. If there is sufficient moisture, there are certain weeds that will immediately spring up before the seed. These may be destroyed by brushing over the top of the soil with a rake, or other instrument, before the seed planted comes up. This can be done by horse-power, using a brush. We run the brush across the drills for the purpose of more effectually destroying the weeds just starting up. I think the use of the brush or harrow at this time very great economy of labor. [The process of the development of the seed was given in detail on the blackboard.]

Grains have but one seed lobe. But there is a large class of seeds, the bean for example, that has two lobes. You will observe this on breaking them open after soaking them in water. The germ of the seed lies between these lobes. One produces the root and the other the stem. The descending axis becomes the root and the ascending axis becomes the stem. The special function of these seed lobes is to furnish food for the embryo plant until it is sufficiently developed to draw its nourishment from the soil and atmosphere. They fill the office, for the time, of digesters. At any rate, by the addition of moisture, they are capable of developing the young plant, and sustaining it until it is able to take care of itself.

The next point for our consideration is the cultivation of these seed plants. The object of all cultivation is twofold. First, to stir the soil and put it in such a condition that it may receive moisture and air, and, secondly, to destroy all intruders, by which we mean weeds. Air and moisture are essential to the growth of plants, and these are best secured by the frequent stirring of the soil.

QUESTION—Is it not possible to keep our seedlings growing too long, that is, too late in the season? Will it not be better to stop the cultivation and check the growth before late fall?

ANSWER—It is important that all wood growth should be mature before cold weather, otherwise our trees are liable to injury from frost. But seedling plants are seldom injured in this way.

It is desirable to take up seedling stocks in the fall and heal them in, or store away in the cellar for the winter. Even if the weather is not very severe, so as to destroy the plants, the character of the roots is such that the expansion of the ground by frosts tear the roots, and thus do serious injury. We do not believe that freezing will injure the plants providing they are not frozen in the air and thawed in the air. We wish to avoid this condition of things, and so take up the seedlings in the autumn and store in your cellar, if you have one; if you have not, bury them out of doors. It is very desirable, however, to have them where you can get at them. In taking them up they are bound in bundles, assorting them as to size. Our remarks have particular reference to apples and pears, but will also apply to plums, and even to cherries.

In growing peach seedlings the pits are either frozen or cracked, and planted out in rows, and given thorough cultivation. In the case of berries, the

fruit is mashed and the seeds washed out and planted in boxes, or seed-beds, filled with soil and sand. Grape seeds are planted, not for stocks, but for new varieties only. The seeds are taken from the grape and sowed at once, in the autumn.

If you desire new varieties it is best to take the fruit of the best kinds from which to propagate.

The lecture closed with some remarks on the subject of crossing and hybridizing.

Crossing is the bringing together different varieties of the same species.

Hybridizing is the bringing together of different species. The result is a mule, or, as it is called, a hybrid..

DISCUSSION.

Mr. M. L. DUNLAP—You have heard from the Doctor how to propagate plants, and how necessary it is to pulverize the soil, and how necessary it is that the soil retain air and moisture, and the importance of stirring the soil to destroy the weeds, etc. Let us now make the application to agriculture. Suppose we plow a piece of land for potatoes. We will then harrow, plant, roll, and harrow again, and then let it lay there until the potatoes come through and the weeds make a start. You then apply horse-power to destroy the weeds and let in the air. This is all right. But would you not accomplish the same object with less labor if you had left your land rough until the weeds had started, and then taken your harrow and pulverized it? We think this will accomplish the same result. We have a fine soil, letting in the air, and all the weeds destroyed.

Mr. LUDLOW—I wish to state that at one time I prepared an acre and a half of ground, and had it in fine condition. Having harrowed it I planted it to potatoes. I dropped the potatoes ten or twelve inches apart, run with my harrow through the center of the row, and threw the ground back upon the potatoes, and let it lay until the potatoes came through, when I again ran through with the harrow, and in the fall sold the potatoes for sixty dollars in the ground.

Mr. PARKS—I wish to ask the Doctor, if it is a fair question, whether plants receive more substance or food from the earth than from the air? It is true that plants receive food from both the earth and the air. Scientific men, who have given this subject their attention, agree as to this, but there are a great many men who do not believe that plants receive food from the air, but that

all comes from the ground, and that the plant depends upon the manurial qualities of the soil alone.

Dr. WARDER—There is no doubt that a large portion of every plant comes from the atmosphere. The carbon of plants comes from the absorption of the leaves, taken from the air. Hydrogen is received from the moisture in the air, as well as from the water in the earth. No man can say that only a small portion of substance is received from the atmosphere. A large portion is received from this source—how large a portion we do not feel authorized to say. Still, the earth is essential to plants.

SMALL FRUITS.

A LECTURE BY SAMUEL EDWARDS, OF LA MOILLE, ILL.

Within the recollection of many who do not consider themselves old, the cultivation of an assortment of small fruits was confined almost exclusively to gardens of the wealthy, or for marketing in large cities.

Formerly the apple and other orchard fruits succeeded admirably in nearly all parts of the Northern States, with but little care and attention. There were few varieties of noxious insects injuring trees or fruit, and they so limited in numbers that their depredations were scarcely noticed. By importations from the old world, the rapid increase of them and our indigenous varieties of insect enemies, the cost and uncertainty of growing orchard fruits has been greatly increased.

In sections of our country originally covered with dense forests, their almost entire demolition has occasioned climatic changes so great as materially to lessen the products of orchards.

The small fruits being exempt from injury by the insect depredators of our orchards, and as most of them blossom so late as to run much less risk from damage by spring frosts, the ease with which they are protected from injury in winter by covering—maturing their luscious, health giving products at just the season of the year when most acceptable to the palate and beneficial to the system—there is abundant reason for rejoicing by those who love horticultural progress, as we see the general, rapidly increasing, attention being given to their culture. Many, with only a few rods of ground, now enjoy them in variety and abundance, and their numbers are yearly increasing. Those owning homesteads whose dimensions are counted in acres, should improve their borders and sides of fences by planting small fruits. On the south side of a fence fruits are hastened, on the north retarded, in ripening.

The strawberry, in its different varieties, is adapted to a great range of soils; most of them succeed finely on dry prairies, which produce fruit of better flavor, though not of as large size as are grown on the borders of a slough. Doubtless this deficiency could be remedied almost wholly by underdraining, deep culture, and special manures, though these have not, to my knowledge, had a thorough trial in our State. Where grown for market,

trench plowing, followed by the subsoil lifter, clean culture in hills, mulching for protection from the cold of winter and dirt in spring and summer, are more profitable than a less expensive course; yet the pioneer without capital will feel himself more than paid for his labor if he plants liberally of them on his ordinary prairie breaking, giving them no after culture except a slight mulching at the first beginning of severely cold weather, indicating that winter is near.

Where cultivation is to be done by hand, rows eighteen inches to two feet apart, plants a foot apart in the row. In field culture, rows three feet apart, plants a foot asunder. Use a line in planting, as the cultivation is much more easily done where rows are perfectly straight. A bit of twine, tied to mark each foot of the line, facilitates dropping plants at the right distance apart. We use a steel dibble for this kind of work, which opens a hole large enough to receive the roots well spread out, taking pains to press the dirt firmly about them.

Well rooted young plants only are suitable for setting. They should be taken up with a spade, being careful to retain the roots as much as possible, and to keep them from drying. Trim off any dead leaves, and shorten the roots to two and a half or three inches in length. Puddle roots of all plants and trees.

Early in spring, as the land is in good friable condition, as a general rule, is the time for planting.

Good success is sometimes had in planting until near the middle of May, also, if rather moist weather, just after the crop is gathered.

In one instance, an acre set in August made a good stand with me. Have had several serious and one complete failure of several acres planted at that time. Autumn planting is not successful here, except the weather is unusually wet, advice of those who wish to sell plants to the contrary notwithstanding.

Thorough, deep, clean culture is to be given the first season, taking care not to injure the roots to any considerable extent. For stirring the soil deeply, a half-inch bar of iron, pointed at the lower end, fastened in a plow beam with handles, is drawn by one horse as deeply as the ground has been previously plowed, doing the work better than any other implement known to me.

Runners are cut by hand with a hoe, or with a rolling coulter attached to a cultivator. Always bear in mind that it is much easier to stir the soil and kill weeds as they are starting than when they have attained the height of a few inches, besides the added benefit to the plants by two such workings, at less cost than one when too long delayed.

Some prefer to grow in what is styled the matted row system—planting in rows three and a half or four feet apart.

As the runners appear train them along the row, forming a mass of plants a foot or more in width.

In all cases it is absolutely necessary to mulch just before commencement of winter, covering the plants slightly with prairie hay, corn stalks, or similar material, which has no weed seed in it if possible. Straw is used when no

better article is convenient, but it is objectionable for the reason just stated. The mulching should be loosened up early in spring, when danger of severe freezing is over. , It may remain until after the fruit is gathered, unless there is danger of so many weeds as to injure the crop, in which case it may be removed to alternate rows the latter part of April, in my latitude (41½ deg.), earlier at the south; give one good thorough working, remove the mulch to the rows cultivated, when balance is stirred. The work is finished by placing the mulching around the plants, protecting them in case of drouth, and the fruit from dirt.

After gathering the fruit cultivate between rows; if on the matted row system turn under a part of the plants, leaving a strip of them six inches wide. Draw a little earth around crown of plants, to receive the new roots, which put out above the old ones. Cut off tops of plants just above the crown, which causes the new roots to start at once.

The decaying mulch is, on our new soil, generally all the manuring required. In poor soils, annual dressing with compost, containing a liberal proportion of wood ashes, is recommended.

By permitting runners to occupy space between rows, the old plants can be turned under, after bearing three or four crops. With the successful cultivators of this vicinity, and other parts of the State, present, the discussion to follow these brief introductory notes must prove very valuable. The value of different varieties, in various soils and localities, is a subject of great interest. We all know the Wilson—there are some varieties of a finer flavor, and new candidates for public favor, in considerable numbers, are annually announced as being far superior to any now generally disseminated. Some of these have proved very highly remunerative—to the self-sacrificing philanthropists who distribute them; but most of us are contented to defer purchases until plants are sold at less than $1 each, or $10 per dozen—the customary rates.

The Raspberry is one of the most valuable fruits for drying and canning, by many deemed equal, and even superior, to the strawberry at time of gathering.

A deep rich loam, rather moist than dry, is adapted to best success in the culture of the hardy American varieties. Deep tillage is very essential in preparing for a plantation. The ground can be laid off for planting with a small plow, run shallow. Where land is cheap, and it is desirable to do most of the cultivating with a horse and cultivator, six feet apart each way is a proper distance. Potatoes, cabbages, or some other crop, can be grown in the spaces until the raspberries are of full size. With limited space, three feet by six is adopted generally, planting strawberries between the rows. Use only thrifty young plants, covering the crown a couple of inches. They may be set in the fall or early spring; if the former, a forkfull of manure should be placed over each one, removing it before the plant grows through its covering of earth in spring. In case the dirt appears to be liable to bake before the young shoot makes its appearance, the crust should be carefully loosened with a fork down to the roots. Thorough clean cultivation should be given. Latter part of August cut back to within a foot of the base. If

this is neglected they are seriously injured, and sometimes die outright, in consequence of bearing a full crop the next year. Each succeeding year shorten the main stock to four feet, leaving the branches about a foot long. By this mode they grow strong enough to need no staking, yield more fruit, and of larger size than if left to grow unpruned.

The old wood should be broken down, with any feeble young shoots; leave five or six of the best in the fall, and give a heavy mulching of some kind of coarse litter.

The foregoing remarks have reference to the tall growing American varieties, which are propagated by layering the tips, covering them with two inches of dirt in September.

The Miami, Doolittle and Purple Cane have been well tried and are desirable varieties of this class; plants are hardy, bearing abundant crops of fine fruit.

The varieties which sucker from the root can be planted more closely; three feet by five is a good distance, setting three plants six inches apart, in triangular form, for each hill. The preparation and culture is the same as for the taller growing varieties. Suffer five or six shoots to remain in each hill, treating any others that come up as weeds. Tips of shoots should be cut back one-third their length in the fall.

Brinckle's Orange, like many others of this class, is tender; in severe winters kills to the ground. Its very fine quality induces many to grow it, covering the canes with earth late in the fall. With one hand to bend down and keep them in place, while another covers them with a spade, a couple of hours suffices to secure enough to give an ordinary family a taste of them daily through the season of ripening. The Philadelphia is a very abundant bearer; fruit of only medium quality; believed to be hardy enough to endure our winters, generally. Plants of this class are increased by suckers and root cuttings.

The so-styled Everbearing varieties have not proved of sufficient value in my locality to make them desirable.

The Blackberry requires more space than the raspberry; six feet apart each way answers very well. They require shortening back late in summer, and thinning out of suckers, as recommended for the raspberry, and, for best results, very heavy mulching. Of late they are very often winter-killed in the northern part of the State. W. H. Hausen, of Lee county, protects with corn fodder in winter, having the plants grown rather thickly, in hedge-row style, for greater convenience in covering.

Mr. Merritt, of Battle Creek, Michigan, has practiced laying down the canes in fall and covering with earth. The roots are laid bare at the base, with a fork to manage the tops; one man places his foot against the stock at surface of the ground, bending the root to bring tops down to required position, another man covering with spade.

Lawton, when fully ripe, is fine; more tender than our natives. Kittatinny and some others are said to be hardier. The general mode of propagation is by root cuttings.

The Currant and Gooseberry require treatment so similar throughout that their culture will be described in connection. A deep rich loam, rather moist than dry, is best adapted to them. Although, for a time, in rich soil, they give abundant crops of fruit when neglected, yet they are greatly improved in quality and quantity by liberal manuring, mulching heavily, or clean cultivation. The bush form is preferable, in our hot and dry climate, to growing them as trees. Late in summer, early autumn, or early in the spring, are proper times for planting cuttings. Wood of one year's growth is best, cut in lengths of eight to ten inches; set four-fifths their length in well prepared, rich soil, press dirt firmly at the lower end, filling in loosely at top.

If cuttings are not planted until spring, it is best to cut them before severe freezing, wintering in moist sand in cellar. They frequently form roots an inch or two long during the winter, and make much more growth than if left on the bushes till planting time. They must, in every case, be cut before growth begins.

Vigorous plants, one to three years old, or thrifty offsets, are suitable for setting in permanent plantations, four by six feet, good distances apart. Manure liberally each autumn, or cultivate clean but shallow early in the season, mulch heavily before very hot weather. When they are of full bearing size, shorten long shoots of the current year one-third their length each fall, remove feeble shoots and old mossy and decaying branches, thus keeping up young vigorous wood for bearing. Burn up all trimmings to destroy currant borer.

By planting in shade of buildings, fences or trees, or by covering with some inexpensive material, they may be retarded in ripening and retained on bushes, for use, several weeks.

Red Dutch, White Grape, Black Naples, Victoria and Long Bunched Holland, leave nothing particular to desire for variety of near thirty varieties of currants tested. Cherry and La Versaillaise are large—may be identical.

Downing's Seedling, Houghton's Seedling and American Seedling are good varieties of gooseberry. The large English varieties are so liable to mildew as to render them worthless.

The currant worm is very troublesome in Eastern States, and is kept off by dusting the foliage, when wet, with soot from wood ashes.

Cranberries have been tried to some extent. Have never known of their paying for cultivating in our State.

The barberry, from its extreme acidity, is not desirable for cultivation to any great extent; so far as noticed it does not seem to be nearly as productive as in the Eastern States.

Though we have once seen the Chicago market glutted with small fruits of some kinds, there is room all over our State, at our own doors, in most localities, for selling large quantities of fine fruits, at prices paying much better than ordinary farming. This was the case in Bureau county at the time alluded to, when it was better to leave it to rot than pick for Chicago, without taking into account what can be used at home—worth more than money. For more than twenty years I have found a home market for hundreds of bushels of small fruits.

Our Allwise Father made no mistake when He gave man the fruits of Eden for his food, nor has man, by his wisdom, found a diet more wholesome or acceptable.

Anticipating confidently the presence of a large number of thorough, practical cultivators of small fruits, believing that the time would be more profitably spent in discussion and hearing the results of their experience than in listening longer to one, my endeavor has been briefly to introduce the subject for the evening.

DISCUSSION.

Mr. RICHARDS—I would like to ask what the currant worm is like. I am troubled with a worm, but don't know that it is the currant worm.

Dr. WARDER—This worm is related to the caterpillar. It is voracious, and entirely strips the leaves of our currant bushes.

Mr. RICHARDS—The worm to which I refer is striped and strips off the leaves from the bushes.

Dr. WARDER—I think the gentleman has the currant worm. I would like to have Mr. Rice tell us how he grows his big crop of strawberries.

Mr. RICE—I do not grow them, they seem to grow themselves, and with no difficulty. I prepare the ground by trench plowing, fifteen inches deep. Set the plants out in rows, three feet apart and eighteen inches in the row, and keep them in rows. I think now I shall adopt the plan of keeping them in hills. I keep the runners cut off. In the fall, when the earth begins to freeze, I cover with hay. I gathered from four and a half acres 610 bushels of strawberries. This year I did not have as large a crop as last. The price of berries this year, however, has been, as a rule, greater than last year. I think it is one of the easiest crops to raise. I would as soon raise a crop of strawberries as a crop of corn, after the labor of setting is completed. I remove the hay in the spring from the top of the plants, and, using the fine prairie hay, I can go right in with the cultivator; this is why I prefer the fine hay to the coarse.

Mr. H. J. DUNLAP was called upon to give his experience in strawberry culture. He said: I do not know that I can say anything more to the point than has been said by my friend Mr. Rice. Plow deep, set good plants in well prepared soil, cultivate clean, keep the runners cut off, and you cannot fail to have a large crop of this fine berry.

Dr. WARDER explained the philosophy of cutting off the runners. By cutting off the runners branches were added to the corm, increasing the number of buds, and consequently increasing the quantity and size of the fruit.

A VOICE—Tell us how long these plants will live and bear.

Dr. WARDER—That will depend upon the manner of treatment, and upon the variety you have. Some varieties expend themselves very soon, or run out, as we term it. Indeed this is the case with all varieties when cultivation is neglected. Other varieties, with good treatment, will continue to bear for many years. It is best usually to renew the strawberry plantation every three or four years. It is less trouble than to cultivate or clean the old plantation. Some advise a new plantation every two years. I have seen strawberry beds four years old bear well. In New Jersey they do not practice this system or method of cutting the runners. They plant in rows, five feet apart, as early in the spring as they can, and cultivate occasionally with hoes. The runners are encouraged to grow until they fill the row, and sometimes become a mass of plants three feet wide. This is their condition in May, thirteen months after planting. Instead of the hoe they take the plow and turn a furrow over the path; this is all the cultivation it receives the second and third years. The bed is then shifted to that which was the path, the runners having previously taken root there, when the old bed is plowed up and becomes the path. In this way they renew their plantations and succeed in growing large crops.

Mr. H. DUNLAP—How long will a plantation of Wilson's Albany remain good?

Dr. WARDER—Till the third year, at least. We do not discard the Wilson's Albany, but we do not think it so good as some others.

Mr. RICE—I think the soil of New Jersey is different from ours, and that they may, perhaps, adopt the method spoken of, while in our soil it would not be best.

Dr. WARDER—Some one must try the experiment and see if it will do on the prairies. I would like to see this continuous row system thoroughly tested among us.

Rev. Mr. RILEY—I would ask about the dewberry. Whether it can be cultivated to advantage. I am informed that there is a gentleman on the Cincinnati and Louisville Railroad who is culti-

ting these plants and selling them through the country. It is desirable to know whether they are good for anything or not.

Mr. EDWARDS—I have been growing the dewberry for ten years and am now ruling them out. They are not worthy of cultivation.

Mr. DUNLAP—I have attempted to raise the dewberry for ten years. I have had them in bloom, but have never succeeded in raising a berry. I will give twenty-five dollars to any party who will grow and send me one bushel of these berries.

Mr. H. DUNLAP—I understand that the Wilson Blackberry is sometimes mistaken for the dewberry.

Dr. WARDER—You might mistake them in the first year. The bush grows low, like the dewberry. Some think it is best to pinch the shoots of raspberries and blackberries before the ripening of the fruit, with a view of encouraging the growth of laterals, and not have, as otherwise we would have, long slender canes that could not support themselves. The result of shortening the canes at this time is to make a little tree—it is more like a tree than a bush.

QUESTION—How many branches would you leave upon a single root?

Dr. WARDER—One is better than two, and two are better than three. In the case of the blackberry, one is enough, in the raspberry, two. Every one of these will throw out shoots next year, covered with an enormous amount of fruit.

The Doctor recommended cutting back the canes in the growing season. He had taken a lesson from his old cow, that had broken into his raspberry patch and browsed them down to within one foot of the ground. He never had so heavy a crop as the spring following.

Mr. RICE—I would like to hear from Hiram Dunlap, who is a successful grower of small fruits.

Mr. H. J. DUNLAP—I suppose the diagram on the blackboard will show better than anything I can say as to the proper course to pursue in training and pruning the raspberry. Some canes will run ten or twelve feet if left to themselves; but if you want any fruit you must, in the second year, cut them back to one foot from the ground. These will throw out laterals, which are also cut back to two or three inches from the main cane. The next year the plants throw up strong canes. I usually put in three

stakes to the hill, to which the canes are tied. As soon as the fruit is taken off cut out the old stems. I do not know that this is necessary. The second year the raspberry patch should receive thorough cultivation, and, if expected to produce good berries, should not be neglected at any time. There is one drawback in growing raspberries. It is the borer that gets into them and destroys the cane.

Mr. LUDLOW—I would like to hear from Mr. Dunlap if, in setting out a new plantation, there is any choice in the plants?

Mr. H. J. DUNLAP—I have never seen any choice.

Mr. GALUSHA—Mr. Edwards speaks of special fertilizers. I have tried special manures, but not upon our common prairie soil. I have tried it, and to advantage, upon light sandy soil for raspberries and blackberries. I have used bone dust, superphosphate, plaster, etc., with good results upon certain soils. I do not know that it would be good for our prairie soil. Would be glad to know if any one has thoroughly tested it on our prairie land, and with what results.

Mr. RICE—Good corn ground is good enough for raspberries, without manure.

Mr. GALUSHA—If by good corn land you mean land that would produce one hundred bushels to the acre, I think it is good enough. [Laughter.]

Mr. EDWARDS—On poor soils manure is recommended.

Mr. GALUSHA—In regard to varieties, I think the Philadelphia is, among raspberries, what the Wilson's Albany is among strawberries. It stands at the head of the list for general cultivation. It bears enormous crops of berries. The fruit is not so rich as that of some others. The fact is we do not want, for family use, the richest varieties of raspberries. You can eat your fill of them.

Dr. MORSE—I have had three crops from the Philadelphia raspberry, and can corroborate what the gentleman who has just taken his seat has said. It bears enormous crops and is hardy. The quality is good enough. I have heard it stated that they are hard to pick. The reason is they turn red before they are ripe. When ripe they come from the stem easy enough.

Mr. BUBACH—That does not agree with my experience. I got my plants from Pardy.

Mr. PERIAM—What the strawberry most wants is deep plowing and thorough working of the soil.

Mr. EDWARDS—I believe we shall yet be able to grow blackberries from the seed that will be h ardy and that will give large crops of excellent berries.

He spoke of a seedling that he had that was promising well, and said that he would be glad to send some of the plants to this university for trial. He did not propose to sell any.

Dr. WARDER—I would inquire about the Missouri Mammoth. What is the promise of this berry, about which we have heard so much?

Mr. BUBACH—I have the plants, but no fruit.

Mr. ROBINSON—In regard to the Dorchester. I have examined it upon a neighbor's farm, who has now discarded it in favor of the Lawton.

Dr. HULL—I want to say a word about these strawberries. I have drawn upon the blackboard a figure representing the roots and top of the strawberry plant. Dr. Warder has explained the fact of runners made from the plants, and the practice of some in cutting them off. But he did not make the application exactly that I would have done. We have all heard of Mr. Knox's success in strawberry culture. What is the secret of his success, for example, with the Jucunda? It is simply this, he keeps the runners cut off and directs the forces of the plant to the development of the berries. Now the Wilson produces heavy crops, sometimes without all this care in cutting away the runners, for the reason that the Wilson does not so readily make runners. Hence I sometimes call it the lazy man's variety. The Longworth's Prolific will produce runners to the end of the season, the Wilson will not. We like sometimes to get big berries; we therefore cut away all the buds but two. We by this means force all the power of the plant into these two buds, and when the berries make their appearance we take away all but three or four of them, and these grow to an enormous size. I have sometimes practiced this.

Mr. GALUSHA—I wish to add my testimony to the value of the American Entomologist, published in St. Louis, by Dr. Walsh and Mr. Riley, to fruit growers, and to second Dr. Warder's efforts to enlarge its circulation.

Dr. HULL—May it not be valuable to the farmer as well?

Mr. PERIAM—It is as absolutely essential to the farmer as to the fruit grower.

Dr. WARDER—We get, in the American Entomologist, ten dollars' worth for one dollar.

DISCUSSION ON CATTLE.

The lecturer appointed to talk on Cattle did not make his appearance. The following discussion was had upon the subject:

Dr. MORSE—I have looked forward to the time for the lecture on cattle with much interest, perhaps with more interest than that of any other lecture in this course, and consequently I feel a great disappointment that the lecture has failed. I wish, in the few remarks that I shall make, only to say something that will draw out discussion on this subject.

I endeavored to show in my lecture last week that the cultivation of grass was very important. It is a crop too much neglected in the State of Illinois, in favor of grain growing. We endeavored to show that there was a downward tendency in this kind of farming. The remedy is a resort to grass growing. It is an old adage and has much of truth in it—"No grass, no cattle; no cattle, no manure; no manure, no crops." We certainly need, then, cattle, in order to convert grass into beef, butter and cheese, and also to convert grass into manure, that the fertility of the soil may be kept up, insuring good crops.

Now there may be, and we think there is, too little attention given to the care of cattle. Even where men keep stock, they are negligent and careless in their attention to them.

In many quarters there is carelessness on the subject of breeding. A farmer has twenty or thirty head of cattle, and gives no attention to the manner of breeding. The bulls used are such as come up by accident. A young animal has been, from neglect, allowed to grow up a bull, and this is the animal used for propagating his stock. This is all wrong, and the degeneracy of the stock will sooner or later show it to be wrong. Now we have established improved breeds of cattle, and we can propagate the good qualities of individual stock. We can propagate any qualities desired, even to that of color. If you have a bull of good stock, whose mother was a good milker, you will have good cows for milk. I would not take the scrub bull for nothing, when a good bull could be had for twenty dollars. I would consider it a disgrace to accept of the services of one of these animals. Every man should select his breed with reference to the object he has in view in growing stock.

Upon the deep prairie soil there is perhaps no breed of cattle equal to the Durham or short-horn, equal to any other for beef, certainly, but not perhaps equal to some others for work and other purposes. It should be borne in mind that they require a great deal of feed, and should be able to get that without having to run about for it. The color prefered is red and white. The Durham is a breed of cattle with which most of you are familiar.

Another breed of cattle is the Herefordshire, which makes a very superior beef. There are very few of this breed in the country, but from talk I have had with cattle dealers I find they appreciate the Herefordshire highly.

For beef cattle I consider the Devons the best. The Devons are a distinct race of cattle, and there are no cattle that are capable of begetting their own qualities with so much certainty as the Devons. If you put a Devon on scrub stock you will see the calf take the characteristics of the Devon. I have occasionally seen a little white about the back, but doubt whether it is the best mark of Devons. The only objection to this breed of cattle is that they are small. There are families of the Devons which give rich milk, but usually they are bred without reference to the qualities of good milkers, for beef and working cattle. There are no cattle equal to the Devon for working qualities. They have great strength and endurance in the yoke.

We mention in the next place the Ayershire, with which farmers are more or less familiar. These breeds of cattle mentioned are of English origin. If we had time, and you had patience, we could give you a little of the history of these breeds, which would be interesting to consider. The Ayershire is a Scotch breed of cattle. It is a milking breed, and has been bred for perhaps seventy-five years with a view to the production of milk.

Mr. M. L. Dunlap—Is it not a Dutch breed, improved in Scotland?

Dr. Morse—There are different views on that point. I cannot speak positively in the matter. The color is usually red and white, sometimes brown and white. The colors are distinctly marked. There is no intermixing of colors, always distinct. They are handsome colors. They give the largest quantity of milk—larger than any other breed we have. It is rich milk also, but not as rich as the Alderney gives. But in cheese-making, and where the object is to produce milk, I would use the Ayershire, or

a cross of the Ayershire on native stock. The Jersey or Alderney cattle are celebrated for their milding qualities. There is a little variation in some of these cattle. Their color is more varied than that of the Ayershire. They have also more bone.

The Jersey cattle are brown and white, sometimes almost black and white, others nearly all brown. Frequently they are red and white, and nearly always fawn-colored around the nose, eyes and legs. The milk produces the largest quantity of cream and butter. The Herefordshires give more milk, but not so rich in cream and butter, but equally rich in every other respect. When the milk of the Alderney cow is skimmed it is very poor. The milk of the Alderney is nearly all cream.

Another breed is the Holstein. There is no doubt the Holstein is valuable for milk. The color is black and white, distinctly marked, sometimes large spots of white and black. We speak of color, and especially in the milking breeds consider it of some importance.

There is one other breed that we will mention, that is the Galloway, or no-horned cattle. They are a hardy, healthy cattle, and make good beef.

Perhaps I have occupied sufficient time in this way, and I will now give way to others who may wish to talk or ask questions.

Mr. Cobb was called for. He said: I have not much experience with cattle. I can give you a few facts in regard to the breeding of cattle in a limited way. About the year 1862, I turned my attention to farming, and commenced with the means I had, on the plan of a mixed husbandry farm. I started with a few cattle and a little of everything. My first idea was to have good things of the kind, if it was but little. Being a new comer, my motions were observed by the neighbors, who said "there is Cobb, who is buying new things; he will soon lose money." My reply was, "I have but little to lose, and I will run the risk," and so started out with the view of having good things. I went among the farmers and bought the best cows for from $25 to $35. I got a herd of twenty cows, and then I went down into Kentucky and bought a bull for $400. That was carrying out the idea of my neighbors, that "a fool and his money are soon parted." The result is, so far as the cattle are concerned, I have a very fine herd of cattle after the space of seven years.

In regard to the feeding qualities of cattle, this is my experience. In 45 days feeding, side by side, with meal, the graded stock increased 25 per cent. over all others, and then when sent to Chicago, they were sold in a separate class a cent per pound in advance of the others. This ought to convince any one that if he can afford to have anything he can afford to have a good thing. It is a thing I have been trying to impress upon our farmers in the case of hogs. I sent to Pennsylvania and got two pigs, that cost me $30—Chester Whites—notwithstanding Long John says the Chester White is no breed, only a white hog. I have sent to Chicago pigs that, at 14 months old, weighed 400 pounds. Besides, I find at home ready sale for my pigs for breeding purposes. So that my investment of thirty dollars has made money. We do not lose money when we buy good stock. The farmer who speculates in stock may fail, but the idea is, let the farmer know what he wants, then get the best, or at least that which is good; let him have a certain way of doing things, and then follow up his plan.

Dr. Morse—I think the gentleman has just hit the nail on the head. It does not pay to keep poor stock, and what is more, if you keep poor stock there is a downward tendency, the stock degenerates.

Mr. Cobb—There is another idea. If you have good stock you like to show it to your neighbors, otherwise you don't want them to see what you have got.

Mr. M. L. Dunlap—I wish to ask Col. Colman this question. We know very well that our Eastern friends tell us that our dairy cows do not produce the amount of butter that theirs do. Why is this?

Mr. Colman—Mr. President and gentlemen: I do not know that I can add anything to what has been already said, and very well said, by the gentlemen who have preceded me. I will give some of my experience with stock and answer Mr. Dunlap's question.

In raising cattle I think we should generally select that breed adapted to our locality. I have a large farm in Missouri. The farm being hilly I preferred the Devon, and consequently I procured the Devon. I am very much pleased with this breed for my locality. I would prefer, probably, on these prairies, the Durham. I find the Devons excellent for milk. I purchased a three-quarter Devon of the Hon. W. C. Flagg, of Alton. This cow

raised one calf, and excells as a milker. One reason is, perhaps, I take good care of her, and give her the stuff that makes milk, and if farmers generally would take care to slop their cows they would get more milk and butter. You cannot expect a cow to give milk unless you give her something that makes milk. If you give the cow only prairie hay and corn, this does not produce the most milk. I have found bran best; corn meal and clover hay are good, together with bran.

The reason why the Eastern cows give more milk and make more butter is chiefly because of the better care and keeping that they have. They have better pastures, better and a greater variety of food, and that of the right kind and in the proper quantity. With them how to make the cows give milk is a study. It is becoming a science with them. They have large barns and give their stock protection. What is the shelter that our stock in the West get? It is, perhaps, the poor shelter that a fence will give. We can't expect cows to give milk treated in this way. We should give our cows comfortable quarters, and then they will give milk. I know farmers who have got five or six cows, and never have all the milk and butter they want. They do not feed the cows. They do not shelter them. I tell you, sir, a well supplied barn helps to make the breed. I tell you, also, that the corn crib, the hay and the bran, helps to make the milk.

In regard to breeds, I think very highly, as I have stated, of the Devon. I know there are different families of them. I think that which Mr. Flagg has is the best. I can recommend that breed. I have a bull of that breed, and I can see all through the country thereabout the great good that he has done, and the people are thankful to me that I brought him there. I do not think as much of the Hereford as Dr. Morse does, but we will find that if we will take care of our cows of any good stock, we will have good milkers. Feed and shelter kindly, and they will appreciate it. For milk, that is for dairy purposes, I suppose the Herefordshires are generally preferred.

Mr. BALDWIN—I have been for many years raising cows for dairy and other purposes, and will state my experience. I would, for dairy purposes, take some animals from the various breeds. The secret of having better milkers East, I think, lies in this—they are bred in that direction. If, for example, you have a cow that is an excellent milker, a cow that gives milk up to the time

of breeding; you cross with any good stock, and you by this course obtain a good dairy cow. This is the answer to Mr. Dunlap's question. It will take, perhaps, years to reach the degree of success attained by our Eastern friends. But in a short time the qualities of our milkers may be improved very much. I think the Devons make the best working stock; they are also always good milkers.

Mr. PERIAM, in answer to a question, said that seven-eighths was considered full blood.

Mr. PARKS—I think the gentleman is certainly in a mistake as to what constitutes full blood. I never considered sixty-three-sixty-fourths full blood, although it is nearly so. I would not consider nine hundred and ninety-nine-one-thousandths full blood. There is one peculiarity of the Durham cattle—they have the habit of feeding better than other cattle. They will be hunting for food and eating all day, while the common cattle will hardly have energy to move from their places in search of food.

Mr. PERIAM—I do not want the impression to go abroad that I am mistaken in what is considered full blood. I say seven-eighths is regarded full blood. That is, it is good enough. I do not confound "full blood" with "thoroughbred." Full blood is good enough.

Mr. COBB—Full blood is not good enough. We must have the best that we can command all the time. I think that Mr. Periam thinks so.

Mr. PERIAM—What I did say, or what I mean to say, is that full blood is good enough for the many, the thoroughbred for the few. I am willing that the farmer who can't get the full blood shall have the half-blood, and from that go on improving all the time.

COL. N. J. COLMAN'S LECTURE ON THE HORSE.

Mr. President and gentlemen: I received an invitation from the Hon. W. C. Flagg, Corresponding Secretary of this Institution, to talk to you upon the subject of Horse. The word "talk" pleased me, and to this fact, perhaps, that I was requested only to *talk horse*, you are indebted for my presence at this time. I like that good old Anglo Saxon word *talk*. It reminds me of the times when the aboriginies of our country assembled around their fires and talked over the affairs of their tribes, and if our farmers would hold frequent councils and talk over the affairs in which they are interested, it

would be better for the pocket and better for the intelligence and morals of the community.

I am glad that the great State of Illinois has taken the lead in this matter of holding councils, where the farmers of the State may convene and talk over the matters that directly interest them. I shall, in the discussion of the subject assigned me, give you the results of my experience and observation in breeding horses, just as those who have preceded me have given you the results of their observation and experience in the various and particular pursuits that have most interested them.

Dr. Hull, for example, talks to you upon orchard fruits, and gives you his experience through a long life upon this subject. Mr. Husmann talks to you on the subject of grapes, and we all feel that we have profited by his experience in vine growing. This is just what we want, viz: the particular and individual experience of farmers in that branch of agriculture or farm work to which they have given chief attention.

Now, in regard to horses, they are certainly very useful animals, but let me inquire for what do we want horses? Farmers want horses to work upon the farm; they also raise them to sell, just as they raise cattle and sheep and hogs to sell. These are the purposes for which farmers grow this stock, first for their own use, and then to sell in the towns and cities.

I do not propose, gentleman, to give you a history of the horse, going back to the days of Pharaoh, and tracing the story of the horse all along down to this date. Nor do I propose to give you a history of the various breeds of horses. I propose to deal with the present, and take the horse as we find him.

Small horses are adapted to a hilly country, but are not suitable for the purposes of the farm, particularly on our rich fertile prairies. They cannot haul loads large enough, nor turn furrows deep enough. We want, on the farm, horses that we can use for all purposes.

The Percheron, or Norman horse, is a breed that is being largely imported into this country. It is a good breed for draft purposes. We have a horse in this country—we have them in Missouri, you have them in this State—a horse favoring the build of the Percheron. He can haul immense loads, but he is too big boned and too clumsy for other purposes. He is not adapted to riding. He is not a good buggy or carriage horse.

The farmer, as we have said, wants a horse good for all purposes. He wants a horse that can draw heavy loads; a horse that he can take from the plow and put in his carriage and take his family to church. He wants a horse also good in the saddle. Now, these large clumsy horses are not active enough for all purposes; they are admirable draft horses, but when you have said that you have said all. [The lecturer at this point introduced the Morgan horse, and showed a picture of him as given in the Prairie Farmer.] There is no beauty about him. He is not a horse that I think farmers should breed from, except it be for the single purpose of obtaining draft horses, and even then I would not advise in favor of the Morgan horse. I would say to farmers wanting a draft team, breed from the Percheron, or Norman, horse. I will tell you what I think farmers should raise. I am, on the horse, as

some others are on cattle, I want to get back to the thoroughbred race of horses. I know it is said that these horses are not large enough. I admit that all thoroughbreds are not large enough, but we have those large enough for any purpose. You have them in this great State of Illinois.

How large a horse do you want? About 16 hands high. I would say 15½ hands high is large enough. But some of these horses are 17 hands high There is Patona, 16½ hands high. Do farmers want a horse larger than that? The horse Bonny Scotland is full 16 hands high. Mr. J. C. Simpson has a thoroughbred over 16 hands high. We have at St. Louis (Derby) 16 hands high and over. The imported horse Lexington is full 16 hands high. Now if we can get a thoroughbred horse of sufficient size, what better do we want? For one I would not wish to go back of that for my type to breed from. I like the thoroughbreds. Here is muscular development. Here is life and spirit adapted for any purpose. If you want a saddle-horse, no where will you find one that will answer the purpose so well. If you want a draft team you can find it here. They are the most intelligent horses in the world. Treat them with kindness and they will appreciate and repay you well.

In regard to breeding horses. I say get a thoroughbred horse of good size, and then take your largest and best mares, and you will not fail to have good horses for the farm, and also good for the market. You can take them to St. Louis, Chicago, or New York, and get a big round price for them. It is a shame to use our finest specimens of thoroughbreds on the race course, when they could be used to such great advantage in breeding purposes. There is just as fine a chance for farmers here to go to raising horses, if they will give it the proper attention, as to raise cattle, sheep and hogs.

There is a prejudice against race horses, and perhaps I share somewhat in this prejudice. But allow me to say, it is the race course that has developed the qualities desired in a horse. We want to get *action* in a horse. We do not and would not get the action we ought to have, without proper training. But here we get the trotting action. Having one of these horses, you have a most profitable horse from which to breed. I own two stallions. You see I value the thoroughbreds, and I have found the raising of these horses profitable. I sold last year to Mr. Loomis, of Chicago, a horse for $4,000. You could not now buy that horse for $10,000.

Who can help being pleased with the appearance of a beautiful and well trained horse? God has made us to admire the beautiful in nature and art.

Well, I must say something to you about the race course. I do not wish to recommend my farmer friends, and especially my young friends, to waste their time at the race course, or to make trotting trainers of themselves. I believe that the influence of the race course is bad. I do not recommend the raising of horses for the purposes of the race course. The influence is not only bad, but tends directly to neglect of business.

Now in regard to racing at our fairs, and here I know I am treading upon the toes of some. But for the exhibition of horses at our fairs we could hardly sustain them. At St. Louis, at the State Fair last year, we took in $100,000 in eight days. If we had not offered large premiums for fine horses

we would not have taken in one-half of that amount. We have got to get money in this way in order to sustain the institution and make it a success. But really we do not, at our fairs, have racing in the legitimate sense of the term. The horses go round, and the one making the quickest time gets the premium, and if our Illinois friends would adopt this plan and allow the exhibition of speed (each horse trotting alone) they would succeed better. This is only my opinion.

Now a few words in regard to breeding. We should have a thoroughbred stallion, with trotting action. If you get one of this description he will impart himself, even to color, to the colts. Out of forty or fifty colts from a stallion owned by myself, only three have been of a different color. He has simply imparted himself.

I go, for color, largely on bay. I think it is best. I get a colt with fine trotting action. I do not expect to train them. I expect the rich merchants and bankers, and fast young men, will want just such a horse, and I expect to sell him to them.

There is another thing in regard to breeding. Those who keep stallions do not handle them properly. They pamper them and over feed them, do not give them proper exercise. Hence their offspring is not what it should be. Your horse should be in the highest state of health. In order to this, you must give him plenty of exercise, plenty of light, and plenty of air. He should be brought up to a fighting condition almost. Train him as they train a man for boxing. I tell you if you want your stallion to do credit to himself you must give him muscular development, a heart and lungs in perfect health and action, else he can't impart these to his offspring. This is one of the great secrets in good breeding.

I do not believe that a pampered and grossly kept bull is capable of giving the best results. It is not, however, so important in cattle, inasmuch as they are bred for the purpose of being slaughtered. But in the horse these things are of first importance, as he is bred for a very different purpose.

Now in regard to the kind of mares to breed from. Most farmers know what kind of stock they want in a mare. Large mares, or mares with large roomy abdomens, are best. The horse may be comparatively small if the mare is large, with good results. But if you breed a large stallion to a small mare, you may expect to have a wishawashy colt.

In a stallion you want strength and power in the least possible space. It is not so with the mare. She may be, and it is better she be, large and roomy.

You will find that you can work these mares in a moderate way. I have forty brood mares, and I can work them all I wish to do. It is better they be worked or exercised a little every day. After you have the colt the work should be very moderate.

Handle the mare and colt constantly, otherwise the colt may be wild as a deer, and will not be so easily controlled at breaking time. The mares should have comfortable stables and good care in all respects. Colts handled from the first are very easily broken. I have never known one that I could not handle. Perhaps I have got too much notoriety in St. Louis in this respect.

In handling horses I treat them as animals with intelligence. I let them know that I am their friend, and treat them accordingly.

The horse can see better than you can; he can hear better than you can; he can smell and feel just as well as you can. In your treatment of them bear these facts in mind. You have all heard of the great success of Mr. Rarey in his horse taming power. I can take a horse as wild as a deer and soon have him under my control, and it is simply because I convince him that I am not going to hurt him, and that I am his friend. You have got to approach him by degrees. Let him smell of your whip. Get on his bridle. Get the bridle in your hand and you are his master, and in ten minutes you will find he will lie down completely your slave. It will require but a few lessons of this kind for him to know his place and obey your voice. I have broken hundreds of colts, a great many of which I have been able to put at once in the wagon and drive them with whip in hand.

It would be just as reasonable to take a child who had not learned his letters, and flog him because he could not read, as to take these colts and beat them into the harness. You should talk to the horse; he has intelligence that is good "horse sense," and knows when you speak kindly to him. When you want him to stop say "wo." Be patient with him till he gets used to the harness. Let him learn your language, your wishes, and you can do anything with him you desire. You can get him to do anything if you will only let him know what you want. You can get on him and ride him to death, when he could, if he would, dash you to death for such horrid abuse of a poor horse.

That is one of the great secrets in training a horse—let him know what you want. Talk to him just as you talk to your child, and treat him as kindly, and you will never have any trouble with him,

What a noble animal the horse is! And yet how frequently is he the subject of thoughtless and wicked abuse at the hands of his master, he has served so faithfully and so long. He is driven upon the road all day, with perhaps but little water, and upon half rations. He is taken home at night, all mud, and left in that condition, and still with hardly enough food to sustain nature.

I am here to-day to plead for the horse, and to ask for him kindlier treatment than this, noble animal that he is. On the other hand, a great many persons kill their horses by kindness. The stables are too close, too little light and air. The horse is an animal that has lungs; he consumes a great deal of oxygen. Go into the towns and you will find the horse confined in a close stall, almost forbidding him to lie down. The horse wants an abundance of air and light. One reason why we find so many horses diseased in the eyes is because they are confined in dark stables. Then let me urge the necessity of providing for an abundance of air and light in the construction of horse stables. Have windows for your horses eyes as well as for your own. Light is necessary for perfect health. We make a great mistake when we build dark stables.

There is another subject that should be mentioned, and with this I will close these remarks, which I have made with little or no previous reflection.

I refer to the importance of acquiring a knowledge, as far as possible, of *veterinary science*. Quack horse doctors are to be let alone with a vengeance. Wherever there is an intelligent veterinary surgeon it is best to consult him in all important cases. Students in agricultural colleges, and others who have to do with horses, ought to be taught this science.

I thank you for the kind attention you have given me in these rambling remarks. I said in the beginning that I came here only to *talk*, and now my talk is done.

DISCUSSION.

Prof. BAKER—I wish to inquire of Mr. Colman how he would proceed in the management of a balky horse?

Mr. COLMAN—I will give the gentleman a practical illustration of how I would proceed with a balky horse. [Laughter.]

Mr. M. L. DUNLAP—You might take the Professor for the subject of your illustration. [Laughter.]

Mr. COLMAN—I do not pursue Mr. Rarey's system of throwing horses. Some horses balk in one respect and others in another. I have a mare, once owned by Mr. Alexander, of St. Louis. He was offered $2,000 for her. Afterwards the negroes broke her and spoiled her. She became one of the worst of balky horses. Finally he sold her to me. I proceeded in the first place to get up a new dictionary—at least a set of new words and phrases. I then put the mare in my sulky with another animal by her side. I had a large and strong sulky. She would lead but would not drive, so I got a boy to ride this one and lead the mare, while I was behind in the sulky, using the new words. [Laughter.] We went to the city in this shape without much trouble. In going home the mare came to a stop and refused to proceed any further. I was now driving her without the boy. The mare stood there, and I let her stand. By-and-by, when she got tired standing, she made another start, and for a time all was well, when she made another stop, more stubborn to all appearance than ever. I did not fret her nor urge her forward, but let her stand. We staid there till nearly dark. I had made up my mind to stay there as long as the mare wished to stay. But as night came on the balky animal became as anxious to get home as I was, and needed but little urging to continue the journey. [Laughter.] She has not, from that day to this, given us any trouble, and is just as kind and gentle as any family horse need be. She took the premium last year at our fair, over many others.

Mr. WHITE—What is a thoroughbred horse?

Mr. COLMAN—If the gentleman knows what thoroughbreds are, there is no difference between a thoroughbred horse and a thoroughbred bull. We trace all our thoroughbreds back to the English racehorse, and they take theirs back to the Arabian. There is a great difference between thoroughbred animals. I would give a hundred times more for some animals than for others. Old Boston never had his equal; and so with Lexington, and perhaps we may say the same of Red Eye.

Mr. BURROWS—Let me ask Mr. Colman if there is not a thoroughbred draft horse? You have spoken only of speed horses.

Mr. COLMAN—It is not so regarded. None but race horses are considered thoroughbred.

Mr. BURROWS—The lecturer, in speaking of crossing horses, said that if we crossed a large stallion with a small mare we got a wishawashy horse. That I believe to be a good principle in certain classes of stock. But can we cross in that way for training stock if we are to get that which is good for nothing?

Mr. COLMAN—I regret that the gentleman was not in to hear what I said on that subject. This is the very position that I take. The point of my talk was that we should have, as farmers, horses good for all purposes, and if with this we can get the trotting action, so much the better. The farmer does not want to train horses, but he does want horses combining all good qualities. My friend is very far wrong in supposing that thoroughbred has any reference to draft horses.

Mr. RICE—Are "thoroughbred" and "full blood" terms signifying the same thing?

Mr. COLMAN—Not at all, sir.

Mr. WOODS—As I understand the term thoroughbred, it is a specific term, and not generic. If you make it a generic term, then you may speak of thoroughbred draft horses, but as a specific term you cannot.

DR. WARDER'S LECTURE ON THE GRAPE VINE.

THE GROWING VINE.

The lecturer considered first the growing vine. In the growing vine there is commenced an extension of growth called a "shoot." The shoot is at first soft and sappy, not having yet deposited any fibrous matter. As growth advances woody matter is deposited and we have the strong canes of the vine.

We notice that the shoots are made up of joints, or, as they are called in botany, "nodes." The space between the nodes or joints is called the "internodes." The leaf is always started at the nodes. At the axils of the leaves there are buds, which, in a beautiful development, expand themselves into other shoots called laterals. Just as soon as they shoot out another bud appears, and just here is a curious and interesting arrangement. The bud appears first upon the right side, for example, and then upon the left—right and left all the time, this arrangement always remains. [This was illustrated by exhibiting a vine and verifying the fact stated.]

These lateral shoots can be easily controlled at an early period. At the end of the season, when the leaves drop, the name of the shoot is changed, and we call it a cane.

It is important that we get a proper understanding of these terms, in order that we may know what we are talking about. The cane is that portion of the grape vine from which new growth emanates, and upon which fruit is produced. It is the only wood upon the vine that can produce fruit. It is the growth of the season just past, and if we want fruit another year we must save of this wood. Take these canes away and your vine is barren. The cane is the ripened shoot. The stem is the harder and older portion of the vine and is covered with two layers of bark.

PRUNING THE VINE.

The manner or style of pruning and training the vine will depend upon the object sought in pruning, whether we wish to cover a trellis or train to stakes.

The first thing to do is to plant the young vine in the vineyard, the soil having been properly prepared to receive it. The first season it will produce one or more shoots. We then prune the vine so that every leaf and every bud shall do its full duty. The duties of the leaves are to evaporate and assimilate the juices of the vine. In other words, the leaves effect the evaporation needed to aid the circulation and assimilation and form the buds.

Now what are the duties of the buds? They are, as it were, centers of vitality, and by retroaction form the wood fibers and the roots, and establish their own individual existence.

How can we best secure these results? We remark in the first place, we should train the vine upright. If there are too many shoots, pinch out some of them, and check others at the proper time, only do not extend the pruning into the summer, except it be to concentrate the forces of the vine by very moderate pinching. In the fall or winter the growth of the vine, one year set, is cut back to two or three eyes, and if at the end of the second year the growth has not been such as to warrant fruiting, it is again cut back to two or three eyes. When the vine has attained sufficient strength and maturity for fruiting the vines should be trained on stakes or trellises, in a way to secure the best results—that is, in a way to expose them as much as possible to the light and air. The amount or shortness of the trimming should be in proportion to the strength of the vine.

We fruit on canes, or on spurred canes. A cane is, as we have explained, the matured shoot, or one year old wood. The spurred canes are canes cut back.

In training or pruning a vine much is left to the judgment of the operator. He looks at the arrangement of the wood and judges from the strength of the vine what amount shall be left. The general rule is to leave to each cane six, eight or ten buds. The length of the cane is determined not by the number of inches but by the number of buds, for some canes have much longer internodes than others. You must be careful in cold weather not to cut too near the bud.

There are several different systems of pruning, which we will now describe. We will first proceed and prune for the trellis. [The lecturer here drew his diagrams on the blackboard.] First, he pruned with horizontal arms. These horizontal arms may remain the same for years. From these permanent arms shoots are trained upward, six, eight or ten in number, to the height of fifteen or eighteen inches, sometimes twenty inches. The danger always is in leaving too much wood and overbearing the vine. Almost any vine may be made to bear more than is good for it. Other modifications of the renewal system of pruning the vine were illustrated on the board. The Bon system, also spur pruning, the different systems being practiced according to the object sought in training the vine.

Summer pruning is not always properly done, for the reason that it is not understood as to what the object of summer pruning should be. Summer pruning means simply the pinching in of a portion of some of the shoots for the purpose of encouraging the even growth of all. It is sometimes done in midsummer in a most injurious manner. The operator goes to cutting and slashing with his knife, for the purpose, as he says, of letting in the sun and air to ripen the grapes! This is all wrong. Wrong as to time of pruning, and wrong as to manner of doing the work. Summer pruning is really spring pruning. The work should be done early, just when the shoots begin to start, and then discontinued in early summer, and no pruning should be done except with the thumb and finger. There is no occasion for the use of the knife in summer pruning. The objects to be accomplished in summer pruning are twofold, and for opposite purposes—to thin the wood and to thin the fruit—to strengthen the wood and to enlarge the fruit—to check and encourage—to air and to shade.

In fruiting on laterals it is usual and well to pinch back the lateral to within one leaf of the last bunch of grapes. Pinch also those shoots that are running ahead of others; this will equalize the growth of all. When these lateral shoots push again they may be again pinched, and so on as long as desired.

The buds on a cane that has made large growth are not always sure to break. They are called blind buds. The smaller canes are much surer, and are the canes sought by the vine dresser for his bearing canes.

I wish, in conclusion, to impress upon your minds the importance of early summer pruning. I have mentioned this subject, and here repeat, let this work be done at the earliest possible period, and let it be repeated and finished early in June. Early pinching causes the leaves to grow larger, and I

am safe in saying that the four or five large leaves, in the position they occupy, are of more service in ripening the grapes than the fourteen or fifteen smaller leaves without the pinching.

DISCUSSION.

The discussion on this subject was very brief, and was as follows:

Mr. M. L. DUNLAP—The Doctor has told you much about pruning the grape vine. Now I do not believe in the necessity of so much pruning. I would like to hear Dr. Hull tell us something about the spiral mode of training the vine, practiced at Alton. I understand that this system of twisting the vine gives a check to the growth of the vine in favor of the production of fruit, and, further, that this system is simple and requires very little pruning in the spring.

The spiral method gives the best exposure to sunlight and air, and I would not take a leaf off in the way of further pruning. I think the great difficulty experienced at Cincinnati is too severe pruning, and I propose to demonstrate on my own grounds this season the superiority of the spiral mode of training. It is simple and economical.

There are a great many different systems of training the vine, but that which we want in this country is that which will produce the greatest amount of fruit with the least amount of labor.

Dr. WARDER—The spiral system of training is good where it can be done without danger of breaking the vine.

Mr. M. L. DUNLAP—There is no danger in that.

SWINE.

BY HON. ELMER BALDWIN.

My subject is the hog—a subject less poetic than that of the classic vine—less dignified than the story of the horse—the noble charger that bore the chivalrous knight to the combat—less inviting than Flora's fragrant breath, or Ceres or Pomona's bountiful stores. And it is very doubtful if the use of the product of the hog as human food is not decidedly deleterious to physical, mental and moral health and vigor. Yet the time is doubtless far in the future when mankind generally will appreciate that fact, and cease to go the whole hog—and the hog is not without its classic fame, it has its legends both in song and story.. The victor in combat with the wild boar was in the olden time a hero among his comrades, and he was rewarded with the smiles of his lady love. And there is no animal that has furnished the same amount

of human food during the historic period. The hog belongs to the class mamalia, order Pachydermata, genus Suidæ or Sus.

The fossil bone of the hog is found in the Miocene and Pliocene deposits of the tertiary strata, associated with those of the Mastodon and Dinotherium, that seems to have been the age of Pachyderm or thick-skinned animals, only two of which order, the elephant and hog, have ever been domesticated. The fossil hog was shorter than the domestic hog of modern times, but was evidently his progenitor. The wild boar, from which our domestic hog has doubtless descended, with its closely allied species, are disseminated over near the entire habitable globe, and have been the companion of man from the earliest antiquity. The hog is a perfect cosmopolitan, adapting itself to all climates. Omniverous in its diet, eating herb, seeds, grain, fruit, insects or flesh. More prolific than any domesticated animal except the rabbit, easily susceptible of improvement, and quickly attaining to maturity, it furnishes a cheaper and larger return of food for the outlay than any other animal reared for food. Consequently, in an economical point of view, the hog occupies a prominent place, and as a source of income to the farmer, for ready sale and certainty of remunerative return, is not surpassed by any other branch of his varied pursuits. Particularly is this the case in the Northwestern States, where varied and cheap food and rich pastures make it the paradise of swine.

The census of 1860 shows that there were then in the United States thirty-three and a-half millions of swine, of which the State of Illinois contained two and a-half millions, or about one-thirteenth of the whole. The census shows that the rearing of hogs is influenced by the price of their food and transportation, the pork costing much less for transportation than the bulky food of which it is made.

In 1860 the New England States had 10 hogs to each 100 inhabitants; the Middle States, 81; the Western States, 149; the Southern States, 175; the Pacific States, 101, and an average of the United States, 106. During the year ending March, 1868, there was received in Chicago 1,883,873 hogs, estimated to be worth about $30,000,000; and during the year ending January 1, 1869, there was received 1,706,000, the gross weight of which averaged about 230 pounds, and worth over $28,000,000.

The amount of this trade may very justly stimulate our farmers to inquire as to the best system of breeding, feeding and fattening, and the best breeds on which to expend their efforts in the production of this important staple.

BREEDS AND BREEDING.

There are several good breeds which lay claim to public favor—none of which are free from defects, or which embody all the points of a good hog. The Berkshire has retained the good opinion of the public longer than any other breed, and the improved Berkshire is probably our best breed. The Berkshire was first obtained by crossing the Neapolitan with one of the large English breeds. The Neapolitan is a descendant of the improved Roman hog, probably from their best, a proof of the skill of that ancient people in that direction.

Most of the improved English breeds were obtained by a cross of the large and rather coarse English hog with the fine and delicate Chinese. The Suffolk is the result of one of these crosses, and is esteemed the best breed in England. It is of fair size, and retains in a remarkable degree the fine fattening qualities of its China parent.

The pure Suffolk is almost destitute of hair, a very serious defect under our scorching sun and dry and hot climate; it is rather tender for our western treatment, but in fattening gives a good return for all the food consumed.

There are several American breeds that have attracted attention, as the Magee hog in Ohio, and the Chester White from Pennsylvania, both good hogs, but as yet hardly entitled to be called distinct breeds. It requires a long continued breeding in one direction, with careful and judicious selection, to form a distinct breed, so that all the pigs will be of uniform character, size and form. Till fully established, there is a tendency to breed back generally to the most defective progenitor, and till that tendency is overcome the certainty of reproduction in its perfection cannot be relied on.

The Chester White, when distinctly established, will be as most of the breeds are now, valuable hogs; the square and deep form, stout and erect legs, broad and short head, quiet disposition, good fattening qualities, and heavy weight, form a combination of good qualities that can hardly be surpassed.

Although our best breeds of hogs were obtained by judicious crossing, and our future successful efforts will be perfected in the same way, yet the indiscriminate crossing practiced by our farmers cannot be too strongly condemned. There seems to be a mania for mixing all breeds, while the aim should be to preserve each breed distinct and pure. We often see litters of pigs with no two alike, but each a representation of some one of the eight or ten breeds whose blood is mingled in the genealogical compound. I once made a cross of the Irish Grazier, a large, slow maturing hog, with the Berkshire, and then crossed that sow with the Suffolk, and the produce was three distinct breeds from the same litter—first, a fine delicate pig, that would fatten at any age; second, a medium sized hog, that would fatten at twelve to eighteen months, and third, a Grazier hog, that would weigh from five to seven hundred, but must be two or two and a-half years old before they would lay on fat. Preserve the breed pure and distinct, should be the rule.

Both parents should be at least one year old before being allowed to breed, and if the female should be kept till five or six years old for that purpose, it would materially improve the size and vigor of the pigs, while breeding from young sows deteriorates both size and vigor. The period of gestation with the sow is about sixteen weeks, or 112 days. During this period the sow should never be closely confined, but should have ample room for exercise, with free access to water. The food should be generous but not too heavy and heating—such as will insure the most perfect health.

The best season for sows to farrow is April, or early in May. An April pig is worth one-third more than a July pig, and more than double a September pig. Some breeds can be fattened at any age, but none will fatten as well at one year, or as much, as at fifteen or eighteen months. Any hog must arrive fully at maturity before it can be easily fattened. And an April pig can be

kept till a year from the following January at less expense and trouble than a September pig. While suckling the sows should have free access to grass, and should have a generous supply of tolerably rich slop, and if fed in a trough easy of access, the young porkers will soon learn to feed with her, with decided benefit to themselves and the mother. At eight weeks old they should be weaned, and if they have learned to eat with the mother, and are fed milk or dairy slop, with a generous supply of fine bran or coarse meal, they will not fall off, but will continue growing without interruption.

A growing pig should never be fed corn to any amount; it contains too much oil, and does not contain elements of growth. Light grain, bran and shorts, with a good supply of grass and succulent vegetables, should constitute their food. After weaning, a pig should never be made extremely fat, it checks the growth and injures their thrift afterwards. Nor should they be permitted to become poor, a poor pig can never be made to attain the size or form it would have done had it never been stopped in its growth; like a hill of corn, if it once becomes feeble and sickly, no after culture can atone for the injury done. A mangy pig is worthless, and should be consigned to the golgotha where the dead animals of the farm are deposited.

Neat, cleanly and well sheltered accommodation should be provided for swine, especially during the season of growth. The hog has been much slandered in relation to his uncleanly habits. In some respects the hog is more cleanly than the cow or the horse, or most domestic animals. It is true, like the Elephant and other Pachyderms, he is fond of bathing, a cleanly habit, and it is more the fault of his keeper than his own that he wallows in mud when better accommodations are not accessible. But if young pigs have to lie in a damp and dirty bed, their skin soon becomes encrusted with scurf, the ears and tail frequently drop off, and the growth is at once arrested. During the entire rearing, to the time of fattening, the animal should be kept in a sleek, healthy and growing condition.

The natural instincts of every animal must be consulted and followed to produce the best results when domesticated.

The hog is impatient of both heat and cold; any unusual exertion during the heat of summer, especially if in full flesh, will frequently cost him his life. Comfortable shade should always be provided, easy of access, such as will protect them from the noonday heat of the summer sun. Neglect of this is inexcusable cruelty, and will be a serious drawback from the credit side of the pork account.

Equally important is ample protection from the opposite extreme of the winter cold. Pigs dropped in the fall are unfit, with all the care that can or will be given by our common farm accommodations, to pass uninjured the severity of the winter season. Early spring pigs will do much better, but a well covered, well protected, and well littered sty, where the pigs will not lie more than one deep, and where their owner will not have the nightmare from listening to their unearthly screams from suffering from the biting cold, is essential to successful pork raising. I do not believe that any good christian can say his prayers and sleep easily and quietly while the whole neighborhood is made vocal by the cries of his freezing pigs.

During the cold season a proportion of corn as food is not objectionable. It is well calculated to keep up the animal heat, and from the ease and convenience of feeding, it is now and doubtless will continue to be the principal food at that season. Yet the best results will follow when most of the coarser grains, with bran made into slop, and refuse apples, potatoes, or other roots or green food, constitute the diet.

Dry grain of any kind is not the best feed, and for this reason the hogs that follow beef cattle highly fed with corn do better than when they receive the corn directly from the crib.

During the summer, before fattening, a clover or timothy pasture is indispensable to successful fattening and to economical production of pork, and the next best course is soiling with clover, timothy, or other succulent grasses or vegetables. Confinement in small pens and heavy feeding with corn, is the most expensive, as well as the least successful preparation for fattening in the fall that can well be adopted. If fed through the hot weather exclusively on corn, the teeth become sore and the animal is generally diseased. At killing time the livers will generally be found diseased, and it will be found impracticable to make them put on fat.

One autumn, when corn was worth twenty cents, a neighbor inquired of me if I could tell why his hogs would not fatten, and also saying that his neighbors made the like complaint. I replied that the reason was obvious, cheap corn was the trouble; not that ten cent corn is less nutritious than when the price is one dollar, but it is fed too liberally, and neither a hog or any other animal can stand full feeding with corn alone but a few months and continue in health. The proper course is to so feed during the summer as to preserve the animals in the most perfect health, keep them thriftily growing and slightly gaining in flesh, so as to prepare them best for the fattening process, which is always more or less a health destroying process. With good clover or timothy pasture, a little corn or other grain is not objectionable, but they will do well on the pasture alone—they will grow but not fatten—and if kept through the summer on grass alone, will be in admirable condition to take on flesh; they will account promptly for every kernel of corn judiciously given them.

Their teeth and digestive organs are all fresh and in good condition, and with strong appetites and vigorous health, their advance to the condition of respectable porkers is easy and rapid. Sudden changes from solid to succulent food should be carefully avoided, and vice versa, the change from grass to heavy feeding with corn should be very gradual, especially as the fattening season commences.

There is one primary rule in fattening that should never be violated: the change of feed should always be from lighter to heavier, and never from heavier to lighter. Consequently, when taken from grass and vegetables, a little soft corn or meal should be gradually introduced. Corn cut while the kernel is in the milk is good food to follow the grass. The gradual hardening of the grain will be a proper increase of the nutrient quality of the food. When fairly established on a diet of sound corn, it should be fed on a clean floor, and in amount about what will be eaten, but not so as to have a kernel

left. The practice of leaving a quantity of corn more than will be eaten on the feeding floor is a very wasteful and bad practice. The nice point to ascertain is to find, by measurement, the amount that will be consumed without any waste, and then to always measure the feed by that standard, varying the amount as their appetites require. There are no animals that will retain their appetites and thrive as well when fed to a surfeit, with the unused food, blown and dirty, constantly before them, as they will with just enough to give healthy and full action to the digestive organs, and to preserve the appetite unimpaired. To effect this the last of each feed should be consumed with avidity. Thus the old adage, that the lazy farmer who leaned upon the fence while his hogs finished their meal, always had the leanest pork, has much significance.

Plenty of water, with occasionally a little salt, coal and ashes to correct the acidity of the stomach of the gourmand porkers, completes the required dietary. This system of feeding is adapted to corn fattening as practiced at the West.

Our eastern friends have a somewhat different system. First, having secured the necessary buildings, kettles, troughs, etc., they commence the fattening process by boiling vegetables, such as apples, potatoes, pumpkins, or any other that hogs will eat, and, when thoroughly cooked, these constitute the food for the first few days. They then commence adding a very little meal, mixing it with the hot, boiled or steamed vegetables, so as to cook it thoroughly. When the mess has undergone a slight fermentation it is ready for use. The amount of meal is very gradually increased till toward the close of the fattening season, when meal alone is given. The meal is of corn, oats, buckwheat and barley, ground, and fed either mixed or separately. This system resembles the English practice, and, aside from the labor required, is much more economical than the practice at the West of feeding on corn alone. Hogs are made equally fat in much less time.

When our grain can be made into meal as cheaply here as in New England, and labor shall be as plenty and cheap, the eastern system will deserve a fair trial here.

As to the value of corn when fed to hogs, farmers differ very widely. Instances are given where, by actual weight, hogs have put on from 12 to 18 pounds by consuming one bushel of corn. My opinion is, that ten pounds gain for each bushel of corn consumed is a fair estimate. At that estsmate, pork at $10 per cwt. is equal to corn at one dollar per bushel; or at $5 per cwt. it is equal to corn at 50 cents; but to secure even that result, the management must be judicious throughout. Hogs kept in a close pen and fed corn through the whole period of their existence, will figure up the profits on the wrong side of the balance sheet, and much depends on the breed; there will be a wide difference between results from a good and an inferior breed, with the same keeping. There is much point in the reply of the man when his neighbor wanted to get some of his breed of hogs, that "he would want his swill tub too." Yes, both a good breed and a well filled trough are essential to successful pork raising.

—**36

I will only briefly notice some of the diseases of swine and their remedies, and will then relieve your patience. I have but little faith in specific medicine as a cure for hog cholera, or any other disease to which swine are subject, and I have very little faith in a sick hog.

My practice is to turn them loose where there is water and leave them to nature and their own instincts. A larger per centage thus treated recover of any disease than when treated by any prescribed form of medicine. But a sick hog is poor property, and may be regarded, generally, as belonging to the debit side of the account of profit and loss.

The wild animals in their native haunts are seldom diseased. The wild boar in the forests of Europe or Asia, I presume, never had the cholera, but when domesticated his natural instincts are thwarted, his food is changed, he chafes under confinement; sometimes starved, then fed to a surfeit; with filthy pens, exposed to cold and heat, it is not surprising that he becomes diseased.

The laws which govern the nicely balanced organism even of the hog cannot be violated with impunity. Every species of animal has its natural food, habits, condition and natural requirements, and the nearer those can be supplied the more certain the immunity from disease. Any cause that weakens the vitality of any animal tends to invite disease. The practice of *in and in* breeding has a most injurious effect upon swine, rapidly weakening the vitality, and in two or three generations rendering them worthless, if not extinct. When thus weakened, any exciting cause will induce cholera or some kindred disease.

Sudden changes of food, especially from high to low feed, or the opposite, exposure to excessive heat or cold, and an insufficient supply of water, are among the causes of disease to be avoided.

If all the requirements of comfort, good beds and shelter, appropriate food judiciously given, plenty of water for drinking and bathing, and all the natural instincts are supplied as far as practicable, even in a domesticated state there will be little danger of disease. The old superstition that disease is the decree of fate or of unpropitious stars, has long since been exploded, or should have been, and like every other effect is regarded as the result of tangible cause. Avoid the cause and the effect will never be developed. Prevention is better than cure.

Like other domestic animals, the hog is frequently the victim of a cruelty which disgraces humanity. He is but a hog, and his stubborn disposition, which often is more than reflected by his master, is made the pretext for abuse and cruelty, but especially is he the objective point of all the worthless curs within his range; minus ears and tail, he frequently presents a living monument of his wrongs. A man frequently harbors a grudge against his neighbor, but is too cowardly to attack the man, but will dog his hogs instead. Such a man abuses his superiors.

Every animal we rear is entitled to our kindness and protection. Nor is the hog undeserving our regard. Instances have occurred where they have shown much intelligence and even affection. They have been trained to hunt, and the "learned pig" has often "astonished the natives" with his sa-

gacious performances. The acute instinct which directs the pig straight to his home, as the bee flies, miles distant, when he was conveyed in a tight box from home, round a circuitous and crooked road, is a performance that man, with all his faculties, can never imitate.

There is no animal so low in the scale but has characteristics that excite our admiration and wonder. They are all the handiwork of the Great Architect of Nature. If we would rear them successfully we must know their natures, their instincts and their wants, and we shall learn that the treatment which kindness and humanity dictates will bring the greatest pecuniary profit. As the path of duty is the path of happiness, so kindness to the most inferior animals we rear, is the best guarantee of success.

DISCUSSION.

Mr. M. L. DUNLAP—We have a gentleman here who makes a speciality of breeding hogs for the purpose of selling. Perhaps no party has sent out a larger number or a better style of pigs. I refer to Mr. Floyd. He can no doubt tell us something that will be instructive upon this subject.

Mr. FLOYD—The speaker, in the excellent lecture given us, has said all that is necessary to be said. I have nothing further to add that I think would be either instructive or interesting.

A VOICE—At what time would you advise the commencing of feeding grain?

Mr. BALDWIN—Early feeding is always better than late feeding, and having commenced to feed early we would increase the feed until hot weather is past.

Mr. ROBINSON—I would ask what stock of hogs is best for our State? What class of hogs is usually made most valuable in our country?

Mr. BALDWIN—I think perhaps the Berkshire is as good as any.

Mr. M. L. DUNLAP—I will mention a very important use that is made of the hog. In passing through this State I find that many fruit growers are using the hog to pick up the fallen fruit, that contains the codling moth and the curculio. Large orchards are supposed by this means to be kept free from these enemies. Now if this is the case, we have here a hint to fence in our orchards, so we can turn in our hogs and save our fruit. I have no doubt we shall have, before long, to adopt this plan. It is also economical. A small amount of feed will do the hogs, aside from what they get in the orchard.

The only large peach orchard that paid anything last year was Winter and Brothers', at DuQuoin, who kept hogs all the time in their orchard. They believe hogs a perfect immunity against the insect enemies of the peach. They also adopt the practice in their peach orchards of mounding up the earth around the trees. It may be a question whether the mounds or the hogs deserve the credit of saving the orchard. At any rate, we believe that if we will fence in our orchards and turn in our hogs we shall make a good use of them.

In regard to breeds, we think the Suffolk a good hog to turn into the shade of the orchard trees. I have fenced in three or four acres of my own orchard, and I am satisfied that the hogs have benefitted that part of the orchard. Nearly all the sound apples are in this hog lot, and I propose to extend this hog lot. Although I have mentioned the Suffolk as among the best for this purpose, any good hog will answer the purpose.

M. Baldwin—If you turn your hogs into an orchard where there is no green feed they will bark the trees. Hogs prefer grass, but if that is not present they will take to the trees. There is another use made of the hog. We are in some places very much troubled with the wild morning glory. It is very difficult to get rid of it in the ordinary way, but if you will turn in your hogs, they will very soon root it out. I went out one morning to find my hogs. They were no where to be seen. Presently I saw the tail of one of them sticking out of the ground. The fellow was down there after the roots of the morning glory. [Laughter.]

Mr. N. J. Colman—We in Missouri depend very much upon the nuts of the forest to furnish food for our hogs. We can raise hogs there cheaper than you can here in Illinois. I have seen trees where twenty bushels of acorns could be gathered from them. They are excellent food for hogs. I know it is said that mast-fed pork is not as good as grain-fed. Be this as it may, this is the way much of the pork counted good is made.

In feeding grain we have the lazy man's practice, we use portable fences, and let the hogs feed themselves. These fences will inclose five or six acres, and when it becomes necessary the fence is removed to another place. I am not sure that this is not the best way to fatten hogs. It is certainly better than the practice of some, who, having but one small field for the hogs, let them "root or die."

Some one inquired if a clover and timothy pasture was a good hog pasture.

Mr. BALDWIN—Timothy pasture for hogs is to me a new idea, besides, I could not recommend it. I find that hogs will destroy the timothy by rooting it out. Clover is most excellent for hog pasture. They will keep fat upon it if they have plenty of water.

QUESTION—At what time would you turn the hogs upon the clover?

Mr. BALDWIN—In the spring season, after the clover has made a good start.

QUESTION—What about the hog tamer?

Mr. BALDWIN—I think the hog tamer a good thing. I have used it. That is one thing that all farmers having hogs must look after.

Mr. H. J. DUNLAP—Would it not be a good plan to get up a breed that cannot root? [Laughter.]

Mr. COLMAN—Yes, sir; I don't know but you here in Champaign could get up such a breed. [Laughter.]

It is very essential to let the hogs have plenty of stone coal or charcoal. Give them also ashes. In regard to breeds, I may say I have been clean through the mill. I once had a great fancy for the Essex, but I found I could not propagate them. I could not keep the Essex in a condition to breed, they would put on fat. The Suffolk is a good hog. I have lost a few with the quinsy. I have tried the Berkshire and like them, but, like Mr. Baldwin, I like the Chester White best. We had, last year, a breed that came from Illinois to our State Fair, which carried off the premiums. They were, I believe, owned by a Mr. Moore, of Canton, Illinois. They were the Poland and Big Boned China hog, sometimes called the Magee hog. I think favorably of this breed. I do not know, however, that it can be called a breed, it is a cross. After all, there is a great deal in the swill tub in regard to breed. I do not think hogs can be raised profitably and feed upon grain. A clover pasture is indispensable. I agree with Mr. Baldwin in his faith, or want of faith, in pork as being a good article of diet. I would much prefer for my use a piece of mutton or beef. But the people will have pork, and it is the business of farmers to grow it for the profit there is in it.

Mr. PERIAM—In regard to feeding coal to hogs, I think this is essential, especially where three or four hundred are kept together.

Without it the hogs are very liable to disease and death. Coal acts as a preventive of disease. A hog will eat three or four pounds per week, and he seems to relish it.

Mr. JEWETT—I should dislike to see this discussion close without further mention of this spotted hog mentioned by Mr. Colman. It is a hog worthy of your attention. I have grown these hogs, and would advise farmers to look at them, and if any one here wishes to look at them he can do so by crossing the street here. They are a cross it is true, but they are so carefully crossed that they will always produce the same breed or style of hogs, and that any one will be satisfied with them. I know one man that fed 430 of these hogs.

Mr. COLMAN—Where does he live?

Mr. JEWETT—In Warren county, Ohio. It was there called the Magee hog. They are very fine hogs, and will measure more than any hogs that I am acquainted with. He has heavy hams, and they will fatten at any age.

Mr. ENNIS—Do you breed more than once in the year?

Mr. BALDWIN—No, sir; that is enough.

Mr. JEWETT—I wish to ask Mr. Dunlap if he *knows* that sheep will feed upon the trees of the orchard?

Mr. M. L. DUNLAP—I have seen orchards where sheep were kept, and where the ground was cultivated, and all the sprouts and weeds and grass kept down, the sheep would bark the trees. They should be turned out when the green feed becomes short. They are of great service, however, in eating up the fallen apples that contain the codling moth.

Mr. JEWETT—In regard to sheep barking trees, I have a little experience. I turned my sheep into my orchard in Michigan and had 100 trees barked, and I watched the sheep, too.

Dr. HULL—I am fully prepared to indorse the value of hogs in an orchard. They are almost the only protection we have against the codling moth. But we wish to protest against the idea that seems to be gaining ground that the hog is a protection against the curculio in the plum. If the gentleman will come to Alton, I will take him into an orchard where hogs have been kept all the year, and yet not a single specimen of perfect fruit remains on the tree at the close of the season. Gentlemen having no experience with the curculio know not the difficulties with which we have to contend.

He gave an account of his visit at DuQuoin and Centralia some years ago, when he foretold the coming of the curculio, or rather showed them the marks upon their fruit indicating the presence of this dreaded enemy, from whose ravages they had boasted that they were free. He then told them that they must do something more than simply to turn in their hogs. This would not exterminate the "little Turk." Another fact. The curculio is not an imported insect. It is an insect of our own. It has not yet reached England. It may yet reach it, and woe to that orchard wherever the curculio is allowed to come and remain in peace!

Mr. PARKS—I wish to inquire whether the disease of hog cholera is disappearing?

Mr. BALDWIN—I have never had a case of hog cholera, and do not know whether it is on the increase or decrease. I am confident, however, that, with proper care in keeping hogs, there need be no fear from this disease.

SHEEP.

BY A. M. GARLAND, PRESIDENT OF THE ILLINOIS STATE WOOL GROWERS' ASSOCIATION.

As in the past, of all the domestic animals, none have occupied so prominent a place in the history and economy of civilized nations as the sheep, so at the present time no animal bears so intimate a relation to the comfort and necessities of the human family.

Among the many wise and bountiful gifts of nature for the welfare of the human family, none are so indispensable as this animal, furnishing, as it does, at the same time a food so wholesome and nutritious and the most comfortable and healthy of our clothing materials. And we find that man was not slow in availing himself of so generous a gift.

"Abel was a keeper of sheep," and the firstlings of his flock, offered as a sacrifice, were acceptable to the Lord; and the frequent allusions to the sheep all through the Holy Writings and Prophecies, it seems, were intended to have the double office of furnishing appropriate illustrations of the purity and usefulness necessary to the perfect man, and to fix ineffaceably upon the minds of the people of the then and coming ages the prominence of this most indispensable animal.

The shepherds upon the plains of Bethlehem were the first of men favored with a look upon the brightness of the star that marked the birth-place of the Savior of the world.

Nor is this prominence peculiar to sacred history. We find frequent allusions to the sheep in the oldest writings of China, Persia and India, and representations of them are found carved upon the monuments of ancient Egypt.

More than two hundred and fifty years ago (in 1613), John May wrote, concerning the famous "wool sack" upon which the Lord Chancellor of England has sat for ages, as President of the House of Lords: "The antiquitie of wool within this Kingdom hath been, beyond the memorie of man, so highly respected for those many Benefits therein, that a customable use has always been observed to make it the seat of our wise, learned judges, in the sight of our noble Peers (in the Parliament House), to imprint the memorie of this worthy commoditie within the minds of those firm supporters and chief rulers of the land." *

Mr. John L. Hayes, in an admirable paper, read at Philadelphia in 1885, says of the sheep: "This species is endowed with a plasticity, so to speak, so very remarkable that it is more susceptible of modification than any other animal except the dog; so that 'the breeder,' as Lord Somerville says, 'may chalk out upon a wall a form perfect in itself, and then give it existence.' Hence peculiarities are developed in the coverings of different races produced by man, which make the distinctness and variety of fabric which characterize the wool manufacture; and thus we have the coarse Cordova and Donskoi wool for our carpets; the noble electoral wools of Saxony and Silesia for our broadcloths; the strong middle wools of the Southdown and our native sheep for blankets; the soft, long and finer merino wools of France, Vermont and Michigan for thibets, delaines and shawls; the longer and coarser wools of the Cotswold and Leicester races for worsteds in their thousand applications; the very long and bright haired lustre wools of Lincolnshire for alapaca fabrics, and, lastly, the precious, silky Mauchamp wool, the recent triumph of French agronomic skill, rivaling even the Cashmere, for shawls, and the Angora for Utrecht velvets."

The docility, hardiness, easiness of keep and prolificacy of the sheep—strong arguments in its favor in semi-barbarous countries like Australia, South America, Africa, and some parts of Asia, are found to increase in force when mixed with the agriculture of more civilized nations.

SHEEP AS FERTILIZERS.

There is an old Spanish proverb to the effect that "gold springs up where the foot of the sheep has trod." This is literally true as applied to the wealth that lies hidden and undeveloped in the soil. It is certainly not necessary here to dwell upon the expediency, not to say absolute necessity, of maintaining the fertility of our soil. As fertilizers, sheep are unrivaled among the domestic animals. Beneath their "golden hoofs" we see the fields of Great Britain, after centuries of cultivation, rivaling in productions of wheat, and excelling in their yield of grasses, the fertile prairie lands of our own and other Western States. The preponderating, the undisputed, testimony of many of the most successful farmers of Great Britain is, that farming, though now profitable, could not remain so, in many localities, without sheep.

Blest as we are with a virgin soil of unsurpassed fertility, we should constantly keep in mind the fact that it is not inexhaustible; and the sooner we

* See Smith's Memoirs, Vol. I.

give heed to this fact, and learn to diversify our industry, so as to preserve in our soil its original fertility, the better for the most of this generation and all of the unborn millions that, after it, are to find homes and a livelihood upon the bosom of our vast prairies, and along the margins of our beautiful streams.

Sheep should be handled upon every farm in connection with the raising of grain crops. They occupy a place in the economy of the farm that no other animal can fill so well, in consuming the straw and cornstalks and other refuse fodder.

The facility with which the product of the flock is transported is a strong argument in their favor. The greatest drawback in the raising of the great staple of the Northwest, Indian corn, is the expense of getting it to market. We daily see the price of corn quoted, in our lake shore and Eastern markets, at a pretty high figure, but the rejoicing of the farmer is pretty thoroughly alloyed when he reflects that from one-half to two-thirds of this round price has to be paid to railroads for transportation. As sheep are usually fed in Illinois, it requires a bushel of corn to make a pound and a quarter of wool. How much better then to transform our corn into wool, which can be sent to the same Eastern markets for one-tenth to one-twentieth its selling price. The only better way than this would be, after having transformed our corn and grass and straw into wool, to bring the manufacturer to our doors, and let him and his operatives furnish a home market for the other products of the farm, while saving the transportation of the wool one way, and the cloth back again.

LEGISLATIVE PROTECTION NECESSARY.

Notwithstanding these incentives to a generally diffused sheep husbandry, the history of the "flock" in the United States is an eventful one. The instability that has characterized our national legislation, with its bearing upon wools, both in their raw and manufactured states, has shrouded the business of both the grower and manufacturer of this staple with a cloud of uncertainty, alike detrimental to the interests of both; so that the past history of sheep with us can not be written, nor their future conjectured, without touching upon that principle of political economy affecting this and all other branches of industry—the protection of the American against the competitive labor of persons living on lands without cost, in a climate without winter, under a government that imposes, if any, but a nominal tax, and in a state of society which requires but little for its support.

The grower of wool here needs to have the protecting arm of his government thrown around him, in so far that the necessities of his situation, such as high taxes for the support of the government, schools, churches, and the other adjuncts of an advanced civilization, place him at disadvantage when brought in contact with the producers of wool who are exempt from these burdens. Without here attempting an argument in favor of a protective policy in our national legislation, let me say in passing, that, in my humble opinion, such a protective or defensive policy leads to the only road through

which the American producer can ever reach that firm basis from which he can defy the competition of the world. France pursued such a policy until the justly celebrated Rambouillet wools were relieved, by their own excellence, from all competition, when even the producers themselves consented to the abolition of all duties.

The culture and increase of flocks of sheep are, with us, a national necessity. The United States, dependent upon Australia or South America for her raw clothing material, in the event of a foreign war is at the mercy of any power that can man and float half a dozen war vessels. This insignificant force, by depriving us of the means to clothe our army and our people, could freeze us into terms that, under more favorable circumstances, could not be extorted by the combined navies of the world. I have no envy for the foresight of the statesman, or the patriotism of the journalist, who would place his country in a position exposed to such danger. We must defend both the agriculturist and the mechanic, the manufacturer and the laborer, against the cheap labor of Europe and the semi-barbarous countries, even though it costs something to do it. This was the policy of every manufacturing nation of continental Europe after Peace had spread her wings over the desolated war path of the First Napoleon, and the result we see to-day in the thousands of workshops and factories that make Europe one vast beehive.

At that time the policy of England was to keep the other nations dependent upon her for their manufactures, not only of clothing but all other artificial necessaries; and one of her statesmen, Lord Brougham, while urging the great advantage to accrue from such a condition, said: "England can well afford to incur some loss in the export of English goods for the purpose of destroying foreign manufactures in their cradle!"

GENERAL SUGGESTIONS.

The period of gestation with the sheep is five months, though exceptions to the rule, in a variation of two or three days, and sometimes even a week, are not uncommon. The great fundamental law of nature that "like begets like" finds no more exceptions with the sheep than with other domestic animals. In breeding use none but the best animals, and be careful that lambs do not come in the spring before you have grass for the mother. Attention to these points will relieve the farmer of much labor and loss, and go very far towards insuring a healthy and vigorous offspring.

WOOL PRODUCTS OF THE WORLD.

In the United States, with an annual clip of about 100,000,000 pounds, the home demand for wool exceeds the supply by nearly one-third. It may be of interest here for us to inquire for a moment where the wool is raised that clothes the world. The latest estimates available are German.* These place the production of the wools of the globe at 1,610,000,000 pounds, or one and one-quarter pounds to each inhabitant, calculated upon an estimated population of 1,285,000,000 people.

---

* U. S. Economist, June 10, 1865, also address of John L. Hayes.

The amount set down to each country is as follows:

England	260,000,000	pounds.
Germany	200,000,000	"
France	183,000,000	"
Spain, Italy and Portugal	119,000,000	"
Australia, South America and South Africa	157,000,000	"
Russia in Europe	125,000,000	"
United States	95,000,000	"
British North America	12,000,000	"
North Africa	49,000,000	"
Asia, at a very general estimate	470,000,000	"

In the manufacture of carded or clothing wool, from statistics collected at the recent Paris Exposition, the leading countries of the world stand relatively thus:

Rhenish Prussia, first for men's wear; France, first for women's wear; Austria, second for women's wear; France, second for men's wear; Belgium, third for men and women's wear; Prussia, fourth for men and women's wear; England, fifth for men and women's wear; the United States, sixth for men and women's wear, and Russia seventh for men and women's wear.

In combing wool fabrics, France stands first and England second; the other European nations showing nothing to particularly distinguish them from each other.*

The largest flocks of sheep of which we have any knowledge are in Russia. †

Mr Michael Bernstein, of Odessa, describes his production as follows: "The flock of Falz Feim consists of 400,000 animals. The last shearing produced 30,000 poods, washed, and sold for 870,000 rubles, or 2,974,500 francs," or, in plain English, 1,250,000 pounds, selling for $595,000. Another flock is mentioned, as the property of Mr. Tilibert, consisting of 70,000 merino sheep.

We have in the United States not far from 35,000,000 sheep of all breeds. By far the greater part of this number are of the merino family and its crosses. "The merino breeds are distinguished amongst the various types of the ovine species by the fineness of their wool and the abundance of their fleeces." The product of these, with occasional combinations of foreign wool, and, I am sorry to say, sometimes shoddy, are made into the characteristic woolen fabrics of our country, such as plain and fancy cassimeres, sackings, repellants, tricots, beavers, cloakings, woolen shawls, and the different varieties of flannels. With proper encouragement the American grower will soon be enabled to furnish all the card wool or fine wool clothing needed by our population.

* Report of E. R. Mudge, U. S. Commissioner of Paris Exposition.

† Ibid.

AMERICAN MERINOS.

It is cause for just pride to know that to such a high state of perfection has fine wool sheep husbandry been brought in Vermont and some other localities, that the American merino, now recognized as a distinct type, stands unrivaled in the ovine species for symmetry of form, strength of constitution, and in compactness of its fleece. These excellencies are the more gratifying in view of the fact that they have been attained without the sacrifice of that hardness and capacity for enduring long journeys, and aggregating in large flocks, that were such prominent characteristics of their trans-Atlantic ancestors.

Many prudent and successful feeders pronounce this the most profitable sheep for the stall, and they furnish a quality of mutton admitted by many good judges to nearly equal the famed Southdown. It is the generally accepted opinion of those best informed, that this class will furnish a greater return in wool and mutton, for an equal amount of feed and attention, than any other. The exceptions to this rule, if any exist, are to be found in close proximity to large markets, and upon very high priced lands. The weight of fleece from some of these animals is enormous, and shows, in an eminent degree, the success that has attended the efforts of the American breeders in improving upon the original stock as imported from Spain in the early part of the present century. Single fleeces, weighing from eighteen to twenty-five pounds, are frequently taken from choice rams, while in a few exceptional cases as high as thirty pounds has been clipped from a single year's growth. From ewes fleeces have weighed from nine to sixteen pounds. This is of wool in an unwashed state, and quite often is made up of gum or grease.

HOUSING AND PAMPERING.

The custom of housing, feeding too highly, and in every manner unduly developing and retaining in the wool the oily secretions of the animal, has been carried to an extreme no honest practical breeder will justify, and has undoubtedly operated to the disadvantage of all parties—affording, as it has, the opportunity for the impostor to palm off upon the inexperienced purchaser animals either entirely worthless, or at best of very inferior merits. This practice has tended largely to bring "full blood" and "show sheep" into disrepute. Many who have been thus imposed upon now stand ready to denounce the "sheep business" as an unremunerative humbug, and those engaged in breeding choice animals as cheats and impostors. With the cynical statesman of Roanoke, they are ready to "walk half a mile any day to kick a sheep." The housing, and otherwise pampering, of sheep is not necessarily a fraud. If parties resorting to such a custom would inform the purchasers of their animals of the manner in which they had been handled, probably no wrong would be done. I say probably, for any one having experience in such matters will appreciate the difficulty in arriving accurately at the real merits of an animal that has been thus highly pampered. At best it is a useless expenditure of time and money, and unless much intelligence and care

are exercised will redound to the detriment of the constitution of animals and their offspring. Animals possessing real merit do not require any artificial adornments to recommend them to the breeder of judgment and experience, and the sooner the practice is abandoned the better for all parties.

The very severe tests by scouring, to which many fleeces have been subjected lately, demonstrate, however, a marked improvement in the weight of cleansed wool. The tests conducted by the Board of Agriculture of our own State, in 1866 and 1867, developed fleeces averaging from five to seven pounds when thoroughly scoured; while in some Eastern States fleeces have been found to average as high as six, seven and eight pounds—and at least in one instance reached over nine pounds—nine pounds three ounces. This considerably exceeds the weight of the unwashed fleeces of the best Spanish rams at the beginning of the present century, which Youatt places at eight pounds, and Livingston at eight and a-half pounds. It may be of interest to note here that American merino rams are now being transported to Australia—sent there to give "quality and body to the degenerated wools of that locality."

TYPES OF THE MERINO FAMILY.

Of the merino family we have the different types of Spanish (which is the foundation of all the others), the French, the Saxon, the Silesian and the American.

THE MAUCHAMP MERINO.

This part of our subject would not be complete without reference to a new and now perfectly established race, remarkable for its soft and silky fleece, called the Mauchamp Merino. About forty years ago (1828), there was accidentally produced upon the farm of Mauchamp, department of Aisne, in France, cultivated by M. Graux, a ram lamb, badly, even monstrously, formed, with a wool remarkable for its softness, and more especially so for its lustre, which resembled that of silk. Mons. Graux carefully raised this animal and used it for reproduction, obtaining some lambs similar to the sire and others similar to the dams. He then took the animals resembling the sire, and by a careful and tedious course of in-and-in breeding succeeded in forming a small flock, whose wool was perfectly silky. After this he applied himself to the somewhat easier task of modifying their size and form, both of which were objectionable, and has so far succeeded that his flock is said now to compare favorably in these respects with the French Merinos, of which they are an offshoot. A commission of Savans who reported upon the qualities of this new race to the Imperial Society of Acclimatation, say: "The silky wool is destined to replace completely in our own industry the Cashmere which comes from Thibet. It is fully as brilliant as Cashmere, fully as soft; and while it costs less as a raw material, it requires less manipulation to be transformed into yarn, since it does not contain the hair, which must be removed from the Cashmere."

It is greatly hoped that the utility of crossing the Mauchamp with the American Merino will soon be tested by some breeder of the requisite capital and enterprise.

Since writing the above paragraph I have seen the remarks of Hon. John P. Reynolds upon the Mauchamp Merino, in his able report upon the Paris Universal Exposition, and wish here to call attention to them as the opinions of a gentleman of enlarged and liberal views, and the result of a long study, having for its object the good of the agricultural interests of our whole country. Mr. Reynolds seems to entertain no doubt that the cross alluded to could be made profitable in this country, in view of the greatly increasing demand for fine combing wools, and cites the result of experiments in crossing them upon the Rambouillet sheep of France, in proof of the correctness of his conclusions.*

LONG WOOLS.

The long wool breeds are generally distinguished by great precocity, and in raising them the item of mutton is the prime consideration, and that of wool secondary; and in England, where are to be found the most perfect types of this variety, a remarkable success has been achieved in the development of those particular parts of the body giving the best meat, and in producing animals capable of being fattened with the greatest economy and at an early age.

This branch of sheep husbandry, presenting as it does so inviting a field to the farmer, has been too long neglected. Of the long combing wools we consume annually some 6,000,000 pounds,† for a large proportion of which we are dependent upon the British Provinces, from whence we also draw largely for our supply of mutton. Since the abrogation of the Reciprocity Treaty with Canada this interest has received quite an impetus, and if properly fostered and protected will soon take its proper rank in the industrial economy of the country.

RECIPROCITY TREATY WITH BRITISH PROVINCES.

And here let me remind you that a movement is on foot to re-establish the Reciprocity Treaty, which, if successful, will be a death blow to the long wool interest in the United States, and, by sympathy, will greatly injure the fine wool interest. The committee on Ways and Means, at the last session of Congress, reported in favor of referring the question of re-establishing the treaty to the Secretary of State, who is thought to be in favor of granting "free tickets" to such part of the world as he cannot *buy*. This reference, if agreed to by the House, is but one way of voting for the treaty, by dodging a direct vote against it, as Mr. Seward will of course recommend it to the Senate for ratification. The treaty as it formerly existed meant only free use of the New Foundland fisheries for the fishing States, and free lumber for New York, and so far as the agricultural interests of the country may be

* Report of John P. Reynolds to Governor of Illinois, 1868.

† Mudge's Report.

concerned had no reciprocity in it. The true policy for us stands opposed to letting any people have the free use of our markets who do not help us pay the expenses of this government. If Canada, or any other country, wishes to enjoy our commercial privileges, let her throw aside the soiled and ill-fitting garments of royalty, and enter into the fold at the open door, for whoso "climbeth up some other way, the same is a thief and a robber."

VARIETIES OF LONG WOOL SHEEP.

Of the long wool varieties, those most generally introduced into the United States are the Leicesters, the Cotswolds and the Southdowns—though some others are finding their way among us.

The *Leicester*, (probably more generally diffused through England than any other variety) is the result of the remarkably successful efforts of Robert Bakewell, (for whom they are sometimes called,) to produce a profitable mutton sheep. His experiments commenced more than a century ago, and, to use the language of another, "was a successful effort to form a sheep suited to low land and rich pasturage, that would produce the greatest amount of salable mutton from the least food in the shortest time." Their peculiar propensity for fattening may be inferred when it is stated that animals with a coating of fat six inches thick around the entire body are not uncommon.

The *Cotswolds* are a hardier variety, generally exceed in weight, and mature as early as the Leicesters. After these we have the family of "Downs," at the head of which stands the justly celebrated *Southdown*, furnishing the most popular mutton, both in this country and England, from whence they were imported. They more nearly approach the Merino than any of the longer wooled varieties, in their ability to subsist on scanty pasturage and to endure severe exposure.

The *Hampshiredown* is the offspring of a Hampshire and Wiltshire ewe coupled with a Southdown ram, and exceeds the latter in size of carcass and weight of fleece.

The *Shropshiredown* is the result of several crosses between the "Clun Forest," the Ryland, the Hampshire and the Southdown. Their chief characteristics are their fecundity and freeness from liability to disease.

The *Oxforddowns* were produced by coupling Cotswold rams with Hampshire ewes, with an occasional dash of Southdown to perfect the cross.

Of the Lincolns, the Herefords, the Cheriots, the Romney Marsh, and other varieties not yet introduced in this country in any numbers, I will not take time now to speak.

GENERAL REMARKS.

The late civil war gave a wonderful impulse to sheep growing in the United States, as evinced by an increase of ten millions in the number of animals, and a heavy per cent. in the amount of wool. The very general desire to embark in the "sheep business" is fresh in the minds of all. Men of every capacity and avocation made haste to get rich by becoming the owners of sheep. The reaction from this excitement, owing to a number of causes,

readily understood by the business man, has been so severe that under its pressure many have become discouraged, and are turning their attention to other branches of business. Flocks have been sold for less than the value of a single year's clip, or have been slaughtered for their pelts and tallow. Like Bunyan's Pilgrim, we have long walked in the "Valley of Humiliation;" but I firmly believe the darkest hour has passed, and that the immediate future for the wool grower has in it much of encouragement. The stock of raw wools is so low that already we have complaints from purchasers that they have a limited opportunity for making selections. The past year has seen a holocaust among the flocks of the country without a parallel. Nearly forty thousand sheep per week, for the last three months of 1868, were slaughtered in the city of New York alone; while Boston, Philadelphia, and other cities have absorbed more than their usual average. The city of Chicago consumed during the entire year some four thousand per week. We did not raise as much wool in 1868 as we did in 1867, and the clip of 1869 will show a still further decline. So, reasoning from the well recognized laws of supply and demand, both wool and mutton must bring a fair price for sometime to come.

The relative position of wool in our markets for the past two years has been an anomalous one. The average price of wool in Boston market for 35 years preceding the war, was, according to the report of the Revenue Commissioners, 42.8 cents, and that it will soon find its level with the other products of the country there can be no doubt, *except the stability of the present tariff*, which is just now beginning to show something of its legitimate effect. Let the tariff upon foreign wools be repealed, or materially modified, and the days of prosperity, almost of hope, for this great interest are over, until such time as the wisdom or necessities of our people shall demand its re-enactment.

In proof of the correctness of the foregoing views, let me call attention to some speculations upon the future of wools in the New York Economist, a paper whose unremitting devotion to the importing and free trade interests ought certainly to relieve it of all suspicion of an intention to excite the market in behalf of the domestic wool growing interests; it says:

"The heavy importations of wool of 1866 are about all worked off, with very little wool in the country to fall back upon. We do not see why wool at present prices is not the best property at the present time for an investment, and we think those parties who are now laying in stocks are acting wisely, for we cannot see what is to prevent an advance of wool. We do not think the plea that manufacturers are well stocked is a valid one. Nor do we think those farmers are acting wisely who are selling their sheep at a monstrous low price, or slaughtering them for their pelts and tallow. We think it would be well for them to remember the old adage of 'waste not, want not.' * * * * * If farmers will be reckless, and sow the wind, simply because things do not exactly suit them, they must not be surprised if they do have occasionally to reap the whirlwind. They may depend upon it that for the next ten years sheep husbandry will be the best investment that can be made in agriculture."

In view of the fact that the United States has but one sheep to 57 acres of her domain, and as we produce but little more than two-thirds of the wool we manufacture, and a much smaller fraction of the amount we wear, sheep husbandry certainly does present the most inviting field now open to the American farmer; and why the prosperity vouchsafed to those who embark in it by the eleventh-hour prophet of the Economist should be limited to ten years I can see no good reason. Our people are rapidly learning that mutton is the healthiest of all meats; and that they are promptly acting in the light of this new knowledge the reports of the live stock markets at the great commercial centers abundantly prove. Why, then, should the wool grower be discouraged? That, with an over-stocked market, a general financial derangement, and an unsettling of values, incident to the transition from a time of war to a time of peace, the result has been very unsatisfactory footings upon their balance sheets for two years past, no one can gainsay. But what branch of business is exempt from vicissitudes? The fact is that wool has shown, for a series of years, fewer and less extreme fluctuations than any other commodity the farmer has to sell. A review of the market quotations in Chicago for ten years show that the highest price wool has sold for is $1 per pound, and the lowest 27 cents; the highest corn has sold for is $1 12, and the lowest 38 cents; the highest wheat has sold for is $3, and the lowest 58 cents; the highest hogs have sold for is $13 per hundred, and the lowest $3; the highest hops have sold for is 60 cents per pound, and the lowest 4 cents—showing for wool a fluctuation of 369 per cent., against 300 per cent. for corn, 500 per cent. for wheat, 430 per cent. for hogs, 1,500 per cent. for hops, or 369 per cent. on wool, against an average of 683 per cent. on all other products.

CONCLUSION.

Though days of adversity may occasionally overtake the wool grower, let him stand firm, hold fast, take good care of his sheep, and in the end they will take good care of him. The sheep never dies entirely insolvent. Even when starved to death, he leaves his pelt as a legacy to the cruel master who denied him food.

No business is exempt from vicissitudes, as can be read in the melancholy history of the wheat grower. Winter killing, blight, rust, the chinch bug and the midge, have made his fortune a checkered one. The grower of five and ten cent corn has had his share of misfortune in years past. The hog cholera has plowed its deep furrow through the fortunes of the pork grower; and to-day the Texas or Spanish fever hangs, as a sword of Damocles, over the millions of cattle that constitute the present wealth, and upon which are built the high hopes for the future, of so many farmers.

Though the prospect may not be dazzling, no surer avenue to an independent prosperity is open to the people of this country than the one presented through an increase of the growers and manufacturers of wools. Nature has placed within our grasp all the elements that go to make a people great. Millions of acres of grass annually wave a welcome to flocks and herds that

come not, and, in their turn, go down before the destroying fires of autumn, to mingle their ashes with the accumulated fertility of the centuries before them. Unnumbered streams unceasingly ply the water-powers that can be had if we will but take them. Inexhaustible coal beds wait for the developing hand of the miner, as the bride waits for the coming of the bridegroom; and, when assisted by fair and judicious legislation, state and national, we learn to utilize all these gifts so lavishly bestowed; then, and not till then, will this mighty, undeveloped valley of the Mississippi be what God intended it should be, not alone the garden, but the granary, the factory, and the workshop of the world!

FRENCH BREEDS OF SHEEP, AND THEIR IMPROVEMENT BY CROSSES WITH THE SPANISH RACES.

The breeds of sheep in the north of Spain form three groups, perfectly distinct, and characterized; first, by ther form; secondly, and principally, by their fleeces. These three types are designated in their native country under the names of Merino, Churra and Lacha.

First, of the Merinos, or fine wools. The Merino race, in Navarre, resembles somewhat the type which is usually found in France and other countries of Europe, under the same name. Small in size, rather pot-bellied, and altogether presenting a sorry appearance, the only valuable feature about them is their wool. This is short, frizzled, fine and knotty. This race has of late years lost much of its relative value, even in Spain. Raised principally in Estramadura, New Castile and Soria, it forms the major part of the migratory flocks; nevertheless, this race is now less appreciated in the north than in the west of the Peninsula. Increasing slowly, yielding only a medium quality of mutton, they are not even profitable for their wool, which, though exceedingly fine, is too little in quantity to make up for the other inferior qualities. Consequently, this race is very little noticed in the fairs and other agricultural exhibitions, the highest prizes being given to the other races, which are usually much better represented.

Second, the Churra race, or curly wools. They are much more numerous in Navarre, and infinitely more esteemed than the preceding race. They are much stronger and taller, wide in the shoulders, and closely built in the hind quarters. The wool is of medium length, curly and rather coarse. They are held in high estimation for the fine quality of their mutton.

Third, the Lacha breed, or long wool. The distinguishing marks of this breed are medium height, larger in the hind quarters than preceding race, a fine head, black sometimes, small horns, and frequently without any. This race is particularly remarkable for the great length of its wool, which sometimes measures 30, 35, and even 40 centimetres (12, 14 and 16 inches), hanging frequently to the ground, and giving to the animal a very singular aspect, very much resembling the lama.

This curious race lives upon the southern slope of the Pyrennes, to the north of Navarre, and principally in the districts of Irun and Valcarlos. It

lives constantly out of doors, night as well as day, either in sunshine or shade, remaining, without inconvenience, exposed for weeks at a time, to constant rain, which slips off from their thick fleeces without hurting them in the least.

They are never fed except when the snow covers the ground, and then only a little straw and dried leaves, which serves to sustain them till the snow disappears. Some shepherds, during the lambing season only, place their flocks under shelter.

Their mutton is reckoned a little less valuable than that of the Churra race, but is nevertheless of good quality. With a little extra feed they fatten rapidly.

Their fine fleeces are very valuable, and they supply the greater part used in the fabrication of the famous Valentian cloaks. It is remarkable that this race, to which its long wool gives such a characteristic aspect, although living in the same manner as other races, is not subject to so many diseases, and especially those which so often decimate the other Spanish races.—*Le Journal d'Agriculture Pratique.*

DISCUSSION.

Mr. RICE—I will give my experience in the sheep business. The speaker here gave a minute account of the manner in which he was led into the keeping of sheep. He formerly lived in the northern part of the State. Commenced keeping sheep in 1856. Paid for the first bought $1 per head; afterward bought Vermont sheep, at $2 50 per head. He bought of a farmer who had become disgusted with the sheep business. This farmer paid $22 each for what he sold at $2 50. The amount of wool taken, and the price received for it, was very satisfactory. He purchased a Merino buck, and the cross brought him fleeces of wool of seven pounds each. Besides the wool was fine. The people came to get it for stockings. He increased his flock to 200, and with it his profits increased. Finally, he sold his farm, and his sheep with it, except 62, none over three years old. The conclusion of the whole matter was that he would rather keep sheep than any other stock. "I think," he said, "it is very foolish now, when the price of sheep and wool is down to a low figure, to turn attention away from sheep. I do not believe there will ever be a time when sheep will be as low as now.

But I do not wish to occupy the time. I will say, however, that I think we can cross the fine buck with the coarse ewe, with good results.

Mr. Scott—I have some experience in raising sheep, though not with the fine-wooled variety. I breed some of the Southdowns and Cotswold, and sent to Kentucky to get them. My experience is that the Cotswold is not adapted to this cold climate, and in some seasons the wool is inferior. But my Southdowns continue to improve. I consider them the best for our small farms and cold climate. They do not yield as much wool or mutton, but it is better mutton, and commands a better price. I recently sold two car loads of these sheep in Chicago for six and three-quarter cents, when common sheep were selling at four cents. I have on several occasions sold these sheep at an advance of one and a-half cents over common sheep. I wish to say in regard to the dog question that I fear our farmers will have to abandon sheep raising on account of the dogs. Very recently the dogs got into my flock and killed from forty to fifty lambs. I consider that they injured the flock one-half.

Mr. Rice—I ask whether dogs are considered property in the State of Illinois?

Mr. A. J. Dunlap—Perhaps the gentleman will find out if he kills somebody's dog!

Mr. Rice—I have tried it.

Voice—They are taxed, or should be.

Mr. Scott—I would be willing to pay a tax of five dollars on any dog that I was willing to keep. I cannot see why any man wants to keep anything about him that is not worth enough to be taxed. It is only the worthless dogs that run about the country that give us this trouble and loss.

Mr. H. J. Dunlap—Many act upon the principle "you kick my dog, you kick me."

Mr. Robinson—I would recommend for the dogs a piece of mutton with strychnine on it. I would not hesitate to give it to them.

Mr. Scott—If I put out poison on the highway and kill the dog, I think the way the law stands I am liable for the value of the dog.

Mr. Baldwin—I think if the farmers of the State would petition the Legislature they could secure the passage of a law providing that no man shall keep a dog without a license and the payment of five dollars. This would dispose of worthless dogs, for no one would pay five dollars for a dog good for nothing. I

know no better way. I think the Legislature would pass such a law. This is the law in Massachusetts.

Mr. SCOTT—I would ask permission here to introduce a resolution :

Resolved, That we respectfully request the Legislature to pass a dog law in this State similar to that of Massachusetts.

Mr. M. L. DUNLAP—Perhaps we had better examine this question a little. To-morrow we expect to have this Legislature with us. At least we have notice of the coming of about fifty of them. Let us consider well what action it is best to take in this matter. In New York they have a dog law fund. Every man that has sheep killed comes and makes complaint, and if he can prove that the dogs, or dog, killed the sheep, he can get the full value of the animals from this fund.

The difficulty is in the proof. You cannot convict any man's dog of sheep killing. You may know that a dog killed the sheep, but you cannot know, perhaps, that any particular dog did the killing. Now if we had such a general fund from which we could reimburse the farmer, it would be encouraging to those engaged in raising sheep. Now let us ask the Legislature to pass such a law. It is the great hindrance in the way of sheep husbandry, that we have not such a law. Great flock masters, like Mr. Garland, can afford to keep a man with them. Give us this law, and in two years we will double the number of sheep in this State. I prefer to send the pork off and eat the sheep. It is more healthy. When we dispose of the dogs we can have mutton.

Mr. GARLAND—Let me call your attention to the dog law in the state of Ohio. It provides that each man shall return the number of his dogs and the value, and upon which valuation he pays tax. If, by accident or otherwise, his dog is killed, the man killing the dog pays the value placed thereon, and that is the end of it. We had a law in New York which placed a tax upon dogs of one dollar. We found that it did not work well, for the man who had the least of anything else had the most dogs, and when the tax gatherer came round he could get nothing, and that was the end of it. The law of Ohio we found most practicable.

Mr. SCOTT—I still like the Massachusetts law best. I do not think the one dollar tax is the thing, for we know, as stated by Mr. Garland, that the man who has the most dogs has the least of anything else. But this putting a mark upon the dog is a dif-

ferent thing. It reduces the number of dogs. We want to get rid of three-fourths of the dogs in the State.

Mr. M. L. DUNLAP—I think we can soon settle this question. I therefore move that Messrs. Garland, Scott and Baldwin be appointed a committee to draw up a law to be presented to our Legislature.

Dr. WARDER—I keep two dogs. One I value at fifty dollars; the other is a plaything, valued at five dollars. I would not keep a dog that was not worth the taxes. But there are too many worthless dogs in the country for the good of those who keep sheep. I know the difficulty in collecting the dog tax, and know it is not successful. I will tell you what I do. I prepare strychnine and salt my sheep with it. The dogs get it. [Laughter.] I make a great many enemies by it. I could not be elected a constable in my district, because they say they will not vote for a man that will kill a poor man's dog. Still these same men will sit at my table and eat my mutton. They forget this when they come to vote.

The resolution of Mr. Dunlap passed.

QUESTION—Can sheep be cured of the scab?

Mr. GARLAND—I think they can. I cured a flock of 1,000 by dipping them in a strong decoction of tobacco water. The difficulty is in dipping only once. Two applications are necessary. I have on two different occasions cured sheep of this disease in that way. There are a number of nostrums through the country, but they are worthless.

QUESTION—Would it not be best to remove them from the flock?

Mr. GARLAND—Yes.

Mr. GARLAND, in answer to a question of Mr. Rice, said: When the wool is long it requires three or four times as much liquid. I raise a platform, and the juice runs back in the tub. I send to St. Louis and get the sweepings that are bought cheap.

Mr. ROBINSON—Are stems used?

Mr. GARLAND—Yes; but I do not think they are any cheaper than the leaves, had in the way I have suggested.

A VOICE—I will state that a neighbor of mine tried this remedy without success.

Mr. GARLAND—I think the only difficulty must have been in the thoroughness, that is in the want of thoroughness.

QUESTION—How would you treat foot rot?

Mr. GARLAND—I have never been very successful with this disease. It is most difficult to cure. I had rather have scab in my flock three or four times where I would have this once.

Mr. RICE—I will give a receipt which I have tried in a small flock—butter of antimony and corrosive sublimate.

Mr. GARLAND—I have used butter of antimony, and the objection to it is it is too expensive in large flocks. We have also used common blue vitriol, at an expense of fifty cents for 500 sheep; but none of these things are very successful.

Mr. MINER—Suppose mutton to be the object, what variety or cross would you recommend?

Mr. GARLAND—If you have the Southdown you are at the top of the ladder. You do not need anything better for mutton.

The Merino sheep accumulates fat rapidly on the outside, but not on the inside; but the Southdown does not take on fat in this way. I would say all the time that the Southdown is at the head for mutton.

Mr. SCOTT thought, on farms well sheltered, the Cotswold most profitable for wool and mutton.

Mr. M. L. DUNLAP—Our Canadian neighbors grow Cotswold, and prefer it. Now there is this difference in the mutton of the two. The Southdown makes mutton steak, the Canadian boils his and eats it cold. As to the fat, you can pick out that and use it as lard. And this is the best mode of cooking.

AGRICULTURAL BOTANY.

A LECTURE BY ASSISTANT PROFESSOR THOMAS J. BURRILL.

As we look abroad over the land we see upon every side, in infinite variety and endless forms, evidences of vegetable growth. The stately century-clad trees of the forests, the fragrant flowers of spring and summer, the nutritious grasses weaving their carpets of green, and yielding their riches in almost every quarter of the inhabitable world, the mosses and lichens that cover the bark of trees and wreathe themselves in curious forms even upon the tombstones of our cemeteries, the green scum of stagnant pools, the moulds that cover as with hoary age the damp walls of our cellars, and infuse themselves into the neglected preparations of our food, and other forms still more minute, that irreverently plant themselves in the very tissues of our own bodies, causing eruptions, ringworm, and possibly scores of diseases yet to be ascertained—these, and such as these, in the countless hosts of their number, their myriad forms, their untold value and their seldom ever appreciated import-

ance, are the rich legacies which the vegetable kingdom, in the accumulated ages, has left and is still leaving as the munificent inheritance of man. We cannot fix the price of their value. Mathematics may extend its line to the sun and weigh with poised balance the innumerable worlds of the heavens, but its widest reach and greatest bearing forms but the alphabet of an expression for the worth to us of plant life. Let us bargain away the atmosphere we breathe, and pass to the auctioneer, to be sold without reserve to the highest bidder, the water we drink; let the solid earth itself tremble and pass away in thin air, and our lives will be quite as hopeful as when vegetation forgets its office and the plants of the forests and the fields cease to minister to our necessities. They furnish us, directly or indirectly, with all our food, our clothing, our fuel, the greater part of our building material, the white sheets upon which we write; they extract the poisons from the air and render it fit for our use, and they pump up the water from the earth and send it down the valleys in cooling streams to give drink to the thirsty. "Were I a heathen, not knowing the true God, I would not worship the sun, as did the Peruvians, nor the stars, as did the nations of the East, but would bow in adoration to the trees and herbs of the field." Why not, in the absence of the knowledge of a higher power, worship that which provides my wants and pours out its many luxuries to meet my desires—by which or through which we may almost say we live and move and have our being.

But in the beginning man was given dominion over the sea and over the land, and all things contained therein. "God said, behold, I have given you every herb bearing seed which is upon the face of all the earth, and every tree in the which is the fruit of a tree yielding seed; to you it shall be for meat." Like every other gift of the Creator, however, they are ours to improve. He always gives us elements from which we must develop their possibilities. He furnishes the materials; we, by patient study and consummate skill, must learn how to use them. He gives us organs of speech, but long and careful training alone renders the human voice vocal with song and stirring with eloquence. He bids the wild lightning exhibit its terrible speed and power in the sky, but the labors of a Franklin and a Morse were needed to make it tamely and obediently comply with the dictates of man. So the original potato was planted in the soils of Peru, a somewhat bitter, scarcely edible product, from which the world-renowned vegetable has been propagated through the agency of man. The diminutive original of the cabbage, growing wild upon the shores of old England, without a sign to hazard a prediction of its after value, has gathered up its juicy leaves under the fostering influences of culture, and now yields, far and wide over the surface of the earth, its highly prized substance. As it were but yesterday, was developed a more wonderful product from the trees of tropical America and Asia. For ages the trees from which India Rubber and Gutta Percha are obtained grew and flourished, yielded their products and perished; thus generation after generation of them passing away before they became in the least serviceable to man. In 1770 Dr. Priestly refers to the rubber as a substance which had just been brought to his notice as admirably suited for rubbing out pencil marks, and as selling at three shillings sterling—just about a dol-

lar in our currency—for a cubical bit of half an inch, and the record of this first simple use we still have in the name—rubber from India, or India rubber. But it was not till 1839, only thirty years ago, that Mr. Goodyear, of New York, gave it to the world in its present protean form. To-day, to what myriads of uses it is put! Varnishes, paints, tubes, hose and pipes, shoes and clothing, railroad carriage springs, flexible joints, dishes, toys, combs, furniture, beds, tents, traveling bags, covering for submarine telegraph wires, etc., an array of uses such as never fell to the lot of any vegetable product, woody fiber alone excepted. It was a Goodyear in more than one sense that gave to us a new substance of such rare value. The world can well afford to remember the name found stamped upon all these goods, and the time well known as the good-year in invention.

But let us look further. The hundreds of the varieties of wheat, both winter and spring, have, through man's agency, all sprung from one species. See the differences. There is the white chaff and red chaff, the bearded and bald, the early and late, the strong wiry stems and the soft and flexible, the large grain and the small, the dense compact head and the long loose one, the varieties liable to rust and others subject to the attack of insects—yet all were created alike. It is said that all the varieties of the rose came from fourteen species, every one of which had single flowers and very little fragrance. Behold again the dominion of man in the petals of the rose. The apple, of which there are estimated 1,000 varieties cultivated in the United States, are all from one plant—the apparently worthless European crab. The 200 varieties of peaches likewise originated from one species in Persia, their differences wholly due to causes exterior to themselves.

All these illustrations, taken at random from the innumerable number that present themselves upon every hand, are a kind of bird's eye view of the undisputed dominion of man over the forms of the vegetable world. They clearly show us that long culture and well directed care completely and radically changes, so far as their value is concerned, the elementary vegetable forms which the Creator in the beginning planted upon the earth.

The particular methods of producing desirable changes must be in the main passed by in this paper, having been so fully and ably discussed in other parts of this lecture course. Some of them are brought about by simply making the conditions under which growth takes place, more favorable, and is only a change in degree, not in kind; while others consist in interrupting the natural functions and producing vegetable monstrosities. The primary end and aim of all plants is the production of seed by which its species may be perpetuated. It is for this the vine, by spiral coils, lifts itself above the damp earth into the life-giving sunlight; it is for this the oak strikes its roots deep into the earth, and spreads out its ponderous branches bearing their immense load of leaves. Now if the seed is the valuable product, as it is in wheat, corn and beans, we must strive to increase the natural development of the plant, to furnish it an abundance of proper food, to assist it in every way in its natural career. But to develop extraordinarily any other part of the plant, we must resort to checks, to local stimulations, crosses, modified influences in the circulation of sap and assimilation of food.

Nearly all of our orchard and garden fruits belong to this class, hence the necessity of pruning, grafting, hybridizing, etiolating, and the like, all processes well known to our practical fruit growers and gardeners. It is the juicy pulp of the apple, the melon, and the gooseberry, that we value so highly, but this is never produced to a great extent by the plant in its natural state, and it is here that man has achieved some of his greatest triumphs over the vital forms which it has been given him to control. He has given the tints and fragrance to the rose, the nectarine juices to the fruits, the starchy fatness to the roots and subterranean stems, has made the barren fruitful, and the waste tissues to lean with the fullness and richness of their products.

It must not be supposed, however, that man's dominion over nature is not limited, and that because he is made a ruler he is therefore an absolute monarch over his passive vegetable subjects, for in his authority he is, and must eternally be, governed by a constitution and by-laws written out by the finger of the common author of both. Some plants utterly refuse to give up to the will of man any of their time-honored characteristics. The wheat seems perfectly willing, when properly appealed to, to dispense with the awns or beards which tassel its head; but the rye, equally ancient in origin, persistently holds to them. The potato gives up its bitter, somewhat poisonous, properties, and humbly but richly ministers to our needs. The cabbage forgets its ancient worthlessness, but the dog-fennel persists in being simply and senselessly, it seems, dog-fennel still. Indeed, this is the case with most of our noxious weeds.

The technical name given to this disposition to change, under culture, is *sporting*, and plants that may be thus modified are said to sport; but there seems to be no sport about the thorn and thistle, which sprang up under the curse of the Almighty.

But even with those most obedient to man there is a limit beyond which they never go. Some eternal proclamation had been issued to them long before man had an existence, saying, "thus far shalt thou go, and no further," and the command, written in the secrets of their internal structure, has come down with them through the ages, and must go with them to the end of time. The rose, though bearing its thorn, never becomes a thistle, the apple never gives up its individuality and assumes that of the peach or the pear, and, though hundreds of voices and pages of testimony to the contrary notwithstanding, wheat never becomes chess, or cheat, as it is sometimes called. Not that experiment has alone proved this fact, but that the fundamental law of its existence forbids it.

Different varieties, species, and even genera, may be grown together in such a manner that the new plant, called a hybrid, shall partake of the characteristics of both. Many flowers, hot-house and garden plants, are thus originated, and seemingly new species established, but all such plants are unstable in nature, and exhibit a constant tendency to revert back to the primary forms. But the principle has its uses. From flowers of different colors is produced one having both tints, becoming what we call variegated. In the same way fruits and the other vegetable products are modified. A knowledge of the fact will also teach us to avoid such results as are not desirable.

Plants of the same nature must be grown so far apart that the pollen grains, that fine dust from the center of the flower, from the one shall not reach the other. All must have observed how corn of different varieties, planted side by side, mixes upon the ear. The powdery dust from the tassel of one variety falls upon or is carried by the winds to the silk of the other. This latter consists of hollow tubes, each one of which connects a rudimentary kernel with the outer world. The pollen grain falling upon this outward end bursts its spherical covering, and stretching out its inner integument to accommodate itself to its task, descends the long silken channel, and by its union with the embryo grain prepares the way for the fully developed kernel, having the color, size, etc., of one or the other of the varieties. But without this union nothing is formed but the worthless watery sac, which we sometimes find upon the cob. In some plants, when useful products are thus obtained, the varieties are perpetuated by cuttings and grafts, but the seed, if any are produced, which is not always the case, soon give plants possessing the characteristics of one or the other original kinds.

Another element in plant growth, already spoken of in this course of lectures, which, contrary to the prevailing opinion, undoubtedly baffles the power of man. It seems to be a common belief that plants coming from warmer regions may, by continued growth, become adapted to our more vigorous climate. Instances are cited of plants which were grown only in hothouses at first, and afterward found to succeed in the open air, but it should be remembered that, though coming from a warmer latitude, they may not require more heat, and that had they been tried first, would have succeeded just as well. Plants growing under a tropical sun may still be alpine in character from the altitude they occupy. A plant from Southern Africa was introduced into England some years ago and found to succeed only under cover of the hot-house, but a specimen was accidentally thrown into a garden pond and continued to thrive very vigorously. The result did not, as was thought, prove that the plant had become acclimated, but simply that its roots had penetrated deep into the water, which was fed by springs. From the testimony of many close observers, it appears that each kind of plant bears a certain range of temperature, the limits of which cannot be extended by man. Varieties certainly may be secured better suited to the climate, but always at the hazard of losing the valuable properties of the original, for which alone we care for its permanence.

But with all the changes man has wrought in the vegetable world, he has still an infinite task before him in the same direction. The number of plants which now directly furnish us with food or clothing are but a few hundred, while the total number of known species of plants, to say nothing of varieties, amount in all to more than 120,000. Who believes we have found out all their useful properties, or have realized all of their highest possible development? What has been done, and especially in the last few years, forbids such a belief. Something like a century and a half ago, a man by the name of Herd found a peculiar kind of grass growing in the swampy lands of New Hampshire. He procured the seed and began cultivating it for hay, for which, we were told last week, the grass stands eminently foremost in the

order of plants first in value to man. Out in the valleys of the Rocky Mountains grows wild a kindred species of the same grass, softer in texture, not tending so strongly to the formation of woody fiber, and apparently better adapted by its thick growth of base leaves for pasturage. Who knows but our valuable timothy or Herd's grass is to be surpassed by this rival brother? Growing along with it is a species of flax, having apparently all the valuable properties of our field product, and of nearly double the size. Who, again, shall predict what shall be the future of this plant, and of the tens of thousands yet to be brought into use? Who shall teach us to more successfully manage those we already have, in improving their fruits, in avoiding or curing their diseases, in discovering new economical and medical uses? This is the final application of the knowledge received in the study of botany. This is the goal to be reached toward which the science is continually pointing. Like the diamond, it is treasuring up the light gathered from the pointed spires of leaves and shining through irradiated cell structures, and is pouring it in burning lustre upon the pathway of our investigations.

Professor Chadbourne says, to accomplish all we wish and all we expect in bringing the vegetable world to render its riches more abundantly, we must undoubtedly call to our aid the kindred science of chemistry. But here is the great storehouse of materials. * * * * All animals, man included, are so constituted that they cannot subsist upon inorganic elements. We may analyse our food, determine its exact composition, but it will not enable us to feed on minerals. We may prove with all the science of a Liebeg that charcoal and air and water contain all we need, but we know they would form poor fare for our tables. We may call in the aid of chemistry, with all its power, to produce transformations—give it a magazine of the pure elements, and it cannot furnish us with a single grain of starch nor crystal of sugar, nor anything to be a substitute for them. The plants are the only chemists that can take up these inorganic materials and in the wonderful laboratory of their living tissues mould them into forms to support animal life. * * * * We can hardly over estimate the importance to our country if all our young men who travel were so vested in science that they should be able at once to detect the valuable properties of plants and their habits, that all capable of introduction might be secured at once. A single plant might repay for all the time and labor of every American student in this department. But if men are never trained they do not observe, and if a strange plant is forced upon their attention they know so little that they can determine nothing of the prospect of improving its qualities by cultivation, if ever of cultivating at all. If all those who labor among plants, and have opportunities of introducing new, were well versed in botany as it is now understood, this source of wealth would be vastly increased in a single year. The progress would be rapid, the quality would be improved and the number would be increased. Useful plants would take the place of those useless or noxious. Our forests would be better preserved, and new forests would be springing up. Millions of acres, barren and dreary, might be gradually supplying our waste trees if men would learn that forests can be planted, and

were imbued with that spirit of improvement, and care for coming generations, which science has ever had a tendency to produce.

It may be said, with truth, that much of the work already done has been done by those ignorant of science. These results have been the slow accumulation of the ages; we wish now more rapid progress; the times demand it. The same is true of every department of human industry and source of wealth. Discoveries in olden time were accidental. The alchemists in the dark ages, with their alembics and crucibles and chemicals of mystic names, worked by chance, and by chance, from time to time, made some valuable discoveries. But how different is the work of a modern chemist. A thing is to be done, and he is able as once to bring to bear upon the problem all the principles of that wonderful science. Every experiment is performed for a definite purpose, and accidental discovery is the exception, not the rule. So in mechanics, a result is to be reached, and the problem is attempted by well established principles. Those wonderful looms that ply their iron fingers to weave our carpets, were not a chance discovery by Bigelow, they were an invention, reached only by long continued systematic study. So of the discoveries and the improvements in the vegetable kingdom in our day. They must not be left to chance, but be sought under the guidance of science, where alone the course is direct, the progress sure and rapid.

We have attempted thus far to indicate the importance to us all, and especially to the agriculturist and horticulturist, of the study for which we are contending. Let the attention now be turned to some of the special lessons which it teaches. Like every other science, its first great work is to classify and give names. History shows that this has been the chief work in the past; and, it may be added, in no department has there been greater problems to solve, or greater triumphs achieved. What wonder that, with 120,000 species, in their multiplied forms, the task has been long in its accomplishment and herculean in its requirements. From the days of Solomon to the present time, earnest men have been contributing their industry, their investigations and their talents, to this one end. System after system has been advanced, zealously advocated, thoroughly tested, and abandoned, to be superseded by another, destined to share a similar fate. Thus the work went on, groping in the darkness, but struggling for the light. At last, about the year 1682, a luminous *Ray*—a man by that name—came to the aid of the investigators, and the foundation of our present classification was laid. Let us not imagine, however, that this preliminary work was done in vain. To form any valuable classification, a very extensive knowledge of the kinds, structure and habits of plants was absolutely essential. This knowledge, obtained by the rivalries of original and diverse plans, became the building materials from which the goodly structure has now been reared. But man has found that it is not his business to invent schemes of classification, the work having been done in the beginning of time. He is but to read in reverence the handwriting of the Almighty. The seals of the book of nature have been broken, and the broad glittering page, with its exquisite touches of beauty and wonderful revelations, spreads out everywhere to those who will read the story of the creation. It is true that we do not yet always interpret correctly,

neither can we expect to till our knowledge of the vegetable world is complete and perfect; but enough is already known to make our progress in this direction sure, and to give us a clear insight into the mysterious works of their infinite author.

The differences which we observe in plants have been caused in one or two ways. Either all forms were created alike, and have by insensible shadings, due to kinds of food and other external influence, gradually changed in character, so that in one instance we have an oak, and in another a pine; or they were created different, and have, by constant reproduction of themselves, remained true, except in slight variations, to their original types. Common observation always points to the latter, but is it not strange that scientific men are divided upon the question, and are to-day waging war upon each other in hot debate and severe criticism. But let the matter be settled as it may, the lasting value of our classification depends upon the idea that species are permanent vital forms, absolutely unchanging in time beyond a certain limit, and recognized everywhere as belonging to the same family of individuals.

A species may be defined as the entire collection of plants of one kind that have descended from the same parent stock. They will therefore agree in all essential particulars. The properties of one are the properties of the whole. And so we find it in nature. A single plant is found to be poisonous, and immediately we conclude that every other plant of the same essential character is also poison. If one is found to have strong fibrous bark, its kind may be examined everywhere, though continents intervene, and find the same peculiarity. Species, then, are the true subjects of classifications, but the work does not end with them. While they are separated from each other by clear and definite distinctions, several of them are found to exhibit striking resemblances to each other, as if originally modeled upon the same plan. Thus we arrive at the idea of a genus, which is a collection of allied species. Again, upon still broader natural characteristics, genera are grouped into orders, these in turn into classes, the classes into sub-kingdoms, or the primary divisions of the kingdom of plants.

The work of making out a classification has, however, in the main been accomplished. We can hope for but little more in this direction. It now remains for us, as students of nature, to use it to assign upon examination the various plants about us to their proper places in the system. To do this will require an intimate knowledge of the structure, forms and habits of every specimen we examine. We are not only led but compelled to observe closely. We must watch the tiny seedling just bursting from the earth, and follow it carefully in its processes of flowering and fruiting; we must dissect its parts, and, with microscopic vision, note its structure; we must, by the taste, or chemical tests, find out its properties, and seek to pry into the mysteries of its life.

The system of classification, therefore, not only hangs out, as it were, a label upon each plant, as a true guide to the knowledge of its whole species, but stimulates thorough investigation into the structure and life of plants. This brings us to the province of Physiological Botany, in which the great

work of our day is to be done. Here are mighty problems yet to be solved, respecting the conditions of growth, the direct food of plants, the influence of sunlight and heat, the means of securing more bountiful harvests, the modes of increasing new varieties, the finding out of new uses for those we have, and the general influence of vegetation upon the economy of nature. But so much has already been said upon these topics, and to be said under special heads hereafter, that they are in this paper omitted, save one statement from Dr. Sewall, in regard to the influence of vegetation upon climate. He says:

"Tell us how much water the leaves pump up. Let me say here, I do not mean the water that evaporates from the leaf, as it would from a wet shaving, but how much it actually pumps up. It has been demonstrated that every square inch of leaf lifts three five-hundredths of an ounce every twenty-four hours. Now a large forest tree has about five acres of foliage, or 6,272,640 square inches! This being multiplied by three five-hundredths, (the amount pumped up by every inch,) gives as a result 2,352 ounces, or 1,176 quarts, or 294 gallons, or 8 barrels; a medium sized forest tree about 5 barrels; the trees on an acre 800 barrels in twenty-four hours. An acre of grass or clover, or grain, would yield about the same result."

I have made a calculation of the amount of water lifted from the great Amazon valley. * * * * Here is the result of my arithmetic—974,328,-972,628 barrels, 23 gallons, 3 quarts, 1 pint and a fraction. I suppose a professor of mathematics would have told us the exact fraction, but this is near enough, perhaps.

The great treeless plains are rainless, except when a foreign shower visits them. On the plateau of Bolivia it never rains except when the great Amazon valley sends up its surplus waters over the eastern Andes. The vast desert plains of the West afford another illustration of this fact. Regions cleared of forests are always drier, the streams smaller, the rains less frequent. Not only does the leaf pump up water, but all the inorganic matter. The mineral matter of the earth, dissolved by and in the water, is lifted into the tree, and the water is lifted into the tree, and the water evaporating leaves the mineral or ash in the wood. Now the ash in the oak tree amounts to three per cent. of the entire weight. A large tree weighs seven or eight tons, an ordinary, medium sized forest tree weighs five tons; in such a tree the leaf has lifted three hundred pounds of solid earth. Surely the leaf has an elevating influence; it brings earth nearer heaven!

A new field of labor is also opening before the student of botany, that of the vegetable diseases. Perhaps nothing pertaining to plants is so little understood; but the importance of the study and the increased facilities of late years for microscopic observations, will undoubtedly call more attention to the subject. Cold, damp soils, sudden changes in temperature, excessive heat and drought, the attacks of insects and parasitic plants, are among the fruitful sources of disease. So far as observation has gone, it is pretty generally believed that the parasitic fungi are not in the first instance a predisposing cause of disease or decay; but it is known that they materially influence both, after causing great loss and alarming destruction. The spores or germi-

nating particles of these plants are so minute that they readily float invisib to the eye in the air, and being very tenacious of life, await with perfe composure a favorable opportunity to germinate and grow, which they with astonishing rapidity. Doubtless all have observed, upon wet days, jelly-like formation on old leaves, decaying wood, and other substances. some cases this forms so fast that it is popularly believed to have fallen fr the clouds. A gentleman in Australia was, when descending a hill, overtak by a sudden shower, and upon his return found the hill-side so slippery, this fungus or algoid growth, as to render his descent in safety quite hazar ous. We are often astonished at the rapidity with which fields of wheat a attacked by rust, the value of the crop being sometimes totally destroye This is caused by a fungus called *Uredo Rubigo*. It forms yellow and brow oval spots and blotches upon the stem-leaf and chaff. The spores bur through the epidermis and are dispersed as very minute grains. Henslow h shown by experiment that if the diseased seeds of wheat be steeped in a so lution of sulphate of copper, they will not produce diseased grain, and tha the sulphate of copper does no injury to their germination. The solution used is one ounce of the sulphate of copper to a gallon of water, for every bushel of wheat. It is believed that the spores are contained in the seed from the disease of the previous year, and that should the plant meet with nothing to prevent its vigorous growth they would never be developed, but are ready at any time to seize upon their victims if a favorable opportunity presents itself.

As a rule, fungi are never found upon perfectly healthy surfaces. Mildew is a disease caused by a fungus denominated *Puccinia graminis*. The ripe spore-cases of this plant are small dark brown club-shaped bodies, their thicker ends being divided into two chambers, each filled with minute spores, and their lower ends tapering into fine stalks. The clusters of spore-cases sometimes burst through the epidermis, or skin of the plant, in vast numbers. The minute spores seem to enter the plant by the stomata, or air openings in the leaf. In the vine a kind of mildew is traced by Berkely to the attack of a fungus called *Oidium Tuckeri*. For this disease sulphur and the pentasulphide of calcium have been recommended as remedies. Smut spurred rye, the potato disease, the rotting of fruits, and the decay of wood, are all, with many other vegetable diseases, believed to be the result of fungus plants. Ring-worm in our bodies, according to Dr. Fox, is produced by the spore of the fungus which causes the disease getting into the hair follicle, reaching the root and being carried up into the body of the hair. Intermittent and miasmatic fevers are now believed to be due to the same forms of vitalized beings.

But there is still another element in this study of botany, of direct bearing upon our agricultural and other rural pursuits. We are all ready to admit the importance of these avocations. We hear them lauded in sounding terms in public addresses. Their praises are upon the lips of many at our agricultural fairs, and in theory we all agree with the wise man, known to all, who said "Agriculture is the noblest pursuit of man." But, much as we believe in all this, and much as we desire to cherish such a feeling among men, know-

ing that the nation's wealth depends upon it, what do we really find in practical life to-day right here in the shadow of our University. Go yonder in the towns and country round about, and inquire of the young men what they propose to make the business of their lives, and listen to their replies. Hear them talk of law, and medicine, of trades, of civil engineering, or getting an education with a vague idea of being able to do something afterward, while a few out of the many choose the farmer's life. With parents it is not quite so one-sided, but after all, how many among those who labor themselves are there that would not rather have their son become an eminent lawyer, or a wealthy merchant? Now this should not and need not be.

It is not because these occupations are not healthful, for the testimony of all time is to the contrary. It is not because they are not honorable, for among all the pursuits of man they are the most legitimate. It is not because they do not pay, for, with proper culture, nothing offers greater inducements in this respect than our rich prairies. It is not because the labor is greater, for men are every day leaving them for more laborious and harrassing pursuits. It is and must be because the brain is not called into action as well as the muscles of the arm. Let a man have the opportunity of engaging in a pursuit which obliges him to think, and he will not dig potatoes for you with a hoe for the same price. The engineer will clear the way and mark the route, with excessive toil, for a railroad, but will scorn the offer of more money, if such should be the case, for shoveling sand, though his hands are equally soiled and his cheek equally bronzed. The pickax becomes a very different instrument in the hand of a geologist from what it is in the hand of the common stone quarrier. We do not say that farming and orcharding do not require thought, far from it, for they do require and are receiving the closest thought of many of our ablest minds, and in our day more than ever before; but the curse of the employments is that the large mass of those now engaged in them, who are thus searching after other means of making a living, are never trained to think. Things grow up around them in obedience to some unknown law, over which, they imagine, if it even occurs to them at all, they have no control. They do not and cannot see the need, nor the opportunity, of exercising so much brain power, and, to them, mysterious learning. But let the light of that learning shine in upon them, that they may see there is a reason, within their comprehension, for almost every change that takes place about them, from the growing and pointing of a leaf to the prolonged drouths of summer—not a mere matter of guess work, founded upon speculation, but resting upon the broad foundation of undeniable truth; and we shall find these pursuits in practice where, as they ought to be, we now know them in theory, and as they are represented in our high-toned, public-spirited addresses.

Now the teachings and problems of Botany, in its broadest sense, embracing every possible scientific inquiry about plants, whether of the forests, the grasses, the fruits, or the microscopic forms which infest the earth, the air and the water, will furnish him who lives among and by the products of the vegetable world an exhaustless source of pleasurable and profitable investiga-

tion, of close inquiry and of deeply-penetrating, far-reaching, wide-comprehending power of thought.

May the time speedily come when this University—not by teaching one science alone, but all the departments of learning pertaining to the industrial pursuits of man—shall infuse into the very life blood of these callings this inspiring, manhood-developing power. Then shall the best interests of agriculture, horticulture and the mechanic arts be most enhanced, but not these only, for man himself will rise as man and be crowned with power and dominion above them all.

DOCTOR WARDER'S LECTURE ON PROPAGATION BY CUTTINGS.

In a cutting the buds are the important parts. The cutting has a number of buds, and is about twelve or fifteen inches long. We cut some distance from the upper bud, while the cut below is close up to the bud. The wood above sometimes dies back to the bud. In this instance (showing a cutting) we have five buds. The reason we cut near the lower bud is this. The bud is the point of vitality, and the nearer we can approach that the better for the development of the cells. Cut with a sharp knife or shears. Mr. Henderson, who has written that capital book "Gardening for Profit," finds that it makes no difference where you cut, and you may cut in the internode with success, especially in green cuttings. The callus will take place and the roots strike at the end of the cutting.

Many of these green cuttings may be grown out of doors, if put in a shady place, on the north side of a fence. The green wood cutting, used out of doors, requires to be a little further advanced than when used in the green house. In the green house we control the bottom heat. Hot water pipes are used for this purpose. The boiling process keeps up the circulation.

In striking cuttings it is important to keep the sand in which the cutting is placed at a more elevated temperature than the air. This encourages the formation of roots. If the top buds shoot before the formation of roots the cutting will die. You cannot put them out of doors until the soil is warm. It must always be recollected that at the base of these buds there are undeveloped buds, and that the preference is given to what are called "Hammer cuttings." We used to get one dollar per thousand more for those thus selected. It is not necessary to cut them twelve or fifteen inches; often we cut six inches, and we even cut to one eye with success. The single eye is found sufficient. In cutting to a single eye we use artificial heat, as a general thing. The radicals are not confined to the base of the cutting, but will be thrown out at every bud below the surface of the ground. [The lecturer illustrated on the board the different methods of propagating cuttings.] Now these remarks refer to the propagation of grapes more particularly. Some plants are difficult of propagation, and some not so difficult are easier reached by planting the seed.

The apple tree will grow cuttings, but it is not usual to grow the apple from cuttings, because we can get the tree easier by planting the seed and grafting. The current is easily propagated from cuttings. The gooseberry

is propagated in the same way. It is only when we want a new variety that we plant the seed.

The French method of growing cuttings is to bring both ends in contact with the earth. But there is no advantage in this.

PLANTING THE CUTTING.

For this the ground must be put in fine condition. Plow and trench-plow, and thoroughly pulverize. Now suppose your cutting ten inches long—perhaps the usual length. Cut a trench, and place it so that the top of the cutting will just come to the top of the soil, in a standing position. Now introduce fine soil, and tramp down at the base of the cutting. Set two, three, or four inches apart, and give clean culture, or, as is the practice of some, mulch. [The Doctor explained the method adopted by a Mr. Griffith, and upon which he has a patent.] He waits until the ground is warm, and then puts in his cuttings, and mulches with sawdust or other material. The object was to warm up the soil below, keeping the surface cool, in order to give the plant a chance to strike its roots before the bursting of the bud below. Mr. Griffith, in this way, is very successful in growing plants from single eyes, getting, sometimes, two plants from one eye. When asked how many plants he expected from a setting of ten thousand, he said, "eleven thousand!" so great was his success. It should be always remembered that it is not the precise degree of heat or temperature that is needed for the successful development of the cutting, but the comparative degree of temperature between the roots and the top buds.

ANATOMY, PHYSIOLOGY AND ECONOMY OF PLANTS.

BY JOHN H. TICE, RECORDING SECRETARY OF THE MISSOURI STATE BOARD OF AGRICULTURE.

The subject selected is vast in proportions and comprehensive in extent. So vast and comprehensive, indeed, as almost to preclude the possibility of giving, in a single lecture, an intelligible statement of even one of its three subdivisions, much less of its whole. You must not, therefore, feel disappointed if many of the points that will loom up in the discussion are not presented in all their minute details. Time and the occasion necessarily restrict us to the discussion only of general principles.

Plants, in the order of creation, preceded animals; and, in the order of habitation and settlement of the earth's surface, always precede or accompany them. The limits of inhabitation, for either man or animals, are, therefore, inexorably fixed by the limits of vegetable growth. Why are the deserts of Central Asia, and the Great Sahara of Africa, uninhabited by animals? Because no vegetation is there to sustain animal life. And, if ever they will be inhabited, or inhabitable, it will be when man, in the progression of the arts and sciences, will acquire the knowledge and skill to make vegetation grow and flourish there. Plants are the connecting link between the animal and the mineral world. Animals cannot live on inorganic matter. Exposed

where only surrounded by minerals, they must perish, because they have no power to assimilate them, and therefore no ability of being nourished by them. But plants, fixed by their roots to the earth, decompose, by galvanic action, mineral substances found there, and absorb what is their proper food, which, under the influence of light and air, is converted into different vegetable compounds, serving for the food of animals. Then come animals, and feed upon the organized matter that plants have elaborated from the soil and air.

But, if animal life depended solely for subsistence on the vegetation spontaneously produced, the earth would not nourish and sustain one-millionth part of the animals it is capable of sustaining. Hence human skill and science are necessary to take control of vegetable life, and to so direct it as to contribute to the utmost extent to the multiplication and sustenance of animal life.

Man has availed himself largely of the forces of nature, and after subjecting them under his control, has directed them mechanically to subserve the purposes of life. In the great future he will avail himself to a still greater extent of them, and by them will effect purposes not now even dreamed of. But how has he availed himself of cosmical forces to carry on his mechanical operations? By studying their nature, and ascertaining the laws that operate through and by them.

What was true in the employment of wind, water, steam, electricity, magnetism, or any other force used by man as a motive power, is true, and must be complied with, to avail himself of any other forces laid up in the great magazine of nature for his use whenever he has demands for them. And since the primary dependence of all animal life, either for multiplication, extension or sustention, is on an abundant supply of vegetable productions, the study of the anatomy, physiology and economy of plants, is one of primary importance. For man cannot control and direct to the attainment of the highest results, vegetable life, unless he knows the laws by which, and the conditions under which, it operates. I shall, therefore, treat as briefly as is compatible with intelligibility, the subject, under the following three heads:

Firstly. Vegetable anatomy, by which I mean the analysis of the body of plants, so as to determine their organs and general structure.

Secondly. Vegetable physiology, or a description of the functions of the different parts or organs of a plant, and the offices they perform in its individual economy.

Thirdly. Vegetable economy, or the regular operations of nature in the generation, nutrition and preservation of plants.

I. VEGETABLE ANATOMY.

Every plant, or animal, originates from a single primary cell. Anatomically, a cell means a little sack or bladder, filled with fluid. As organic cells are so extremely minute as generally to be invisible to the natural eye, that you may comprehend what is meant by the term cell, I will state that the

compartments of a honey-comb are called cells. Similar are the cells in organic tissue, only they are closed on all sides. If a minute particle of wood is shaved off and placed under a powerful microscope, it is found to be honey-combed with cells. They are so small that in a cubic inch of wood there are often one and a half millions of cells. Whatever the form or size of an animal or tree, it is all evolved by gemmation from a single cell. Each cell, though not differing externally in size or form from thousands of others, yet is so governed in its budding by a *sui generis* law, that it always evolves and reproduces the form and symmetry of its parental type. Men have sought grandeur, the beautiful, wonderful and sublime, in scenes where nature operated on a grand scale, producing an Andes or a Niagara; yet what are the Andes but an amorphous pile of matter, passively upheaved by a subterranean force? And what is Niagara but a passive mass of liquid matter obeying the cosmical force of gravity, and tumbling over a precipice? How does either compare, in the wonderful, with a little cell, filled with a vital fluid, which buds in regular order into other cells, in such places, and in such numbers, as in time to evolve, in all its beauty and loveliness, the original parental type?

The substance constituting the cell walls is called *Cellulose*. It is composed of the same elements, and in the same proportions, as starch. Starch, indeed, seems to be the primary substance out of which all the cellulose group are formed. Starch, Cellulose, Inulin, Dextrine, Bassorine, vegetable mucilage, and Metarabic acid, are isomeric bodies; that is, they are identical in composition, though different in properties. Their composition is expressed by the chemical formula, C 12, H 20, O 10. In starch we have carbon, hydrogen and oxygen, the three most important elements, as far as quantity is concerned, out of which plants are constructed.

All the ternary compounds, such as gum, jelly, cane and grape sugar, oil, resin, wax, tannin, etc., are compounds of various proportions of these three elements. The fourth element is nitrogen. It forms quaternary compounds, in which the four elements are combined in various proportions. Later analyses have shown that most of these bodies are not purely quaternary, but quinary compounds. The fifth element is sulphur. Albumen, which is transmuted starch, seems to be the basis of these quinary compounds, as starch is immediately of the cellulose group. The white of an egg is the familiar form of albumen. From it spring the albuminoids, such as fibrin, casein, gluten, gliadin, mucedin, etc. The albuminoids are sometimes called protein compounds; the term protein, in Greek, signifies to take the first place, or the highest rank, and was adopted to show their physiological importance in the structure of bodies. It must, however, be borne in mind that all these bodies are merely advanced stages towards growth and nutrition of starch, transformed by the action of plant life.

But protein, when found in the cells, has received the name of protoplasm, meaning first formed. It lines the inner walls of the cell, but does not fill it, and apparently is the active agent of transforming the other contents of the cell into organizable matter.

Protoplasm, or the formative substance, is a granular, gummy, azotised fluid, found gathered around the nucleus, or cytoblast, of the cell and its walls. It does not mingle with the other fluid contents of the cell, but possesses a visible stream-like motion, flowing upwards and downwards through them within the cell. The fluids proper of the cell apparently remain passive, while the protoplasm, in transposing the elements present in the cell, is constantly undergoing changes. If the motion were not life itself, or rather the evidences of life, we might conclude that it originated and depended upon the reciprocal action of the chemical elements of the fluid. It unquestionably is vital action, and may be sustained by the chemical, or perhaps galvanic, action, reciprocally of the nucleus (that is cytoblast) and the cellular integument, since the spiral current is always from the cytoblast to the cell wall, and returning from the latter to the former; the nucleus, in other words, is the centre of the motion.

THE CYTOBLAST.

The nucleus, or cytoblast, is a round, but sometimes also oblong, and generally flat, small body, with a sharp edged circumference, occupying the center of the cell. Mostly it is as transparent as water, filled with a very minutely granulated substance. In time, within the cytoblast may appear one or more nucleoli, or minute cytoblasts. New cytoblasts, for future cells, are formed either independently or by division. When formed independently, it seems to proceed from the protoplasm manifesting itself as a nucleolus, around which an integument soon forms. When the multiplication is by division, the original round cytoblast elongates, and soon a segmentation takes place, and instead of one two nucleoli appear. In the division of the mother cytoblast, the protoplasm plays an important part.

FORMATION OF CELLULOSE.

We now know what an organized cell is, and how it multiplies the nuclei for the formation of new cells. We have already seen that the integument of a cell is cellulose; and cellulose, by chemical analysis, is found to be identical in composition with starch. In the point of appearance, the albuminoids and all the protein compounds, stand between it and starch. It therefore has passed through all the intervening metamorphoses.

Cellulose is now generally supposed to arise from the outer hardening of the protoplasm. Its subsequent thickening is formed by alternate layers of hardening protoplasm; and its alteration is supposed to be due to the chemical, perhaps galvanic, action of the protoplasm and elements present in the cell.

The formation of new cells always proceeds from the interior of an already existing one. The cell in which a new one is formed is called the mother cell, and the new ones, in relation to each other, are called sisters, but in relation to the mother cell are called daughters. When but a portion of the contents of a mother cell is consumed in producing new ones, it is called free cell formation; but, on the other hand, when the whole contents of the

mother cell divides into many parts, and a cell springs from each subdivision, it is called cell production by division. In both cases the cytoblast is formed first, and a new cell then incloses it. By free cell formation the mother cell endures as a permanent part of the structure; but when cell formation proceeds from division the mother cell vanishes, its integument sooner or later dissolves, and is consumed in forming cell membranes for the daughters. This latter species of cell formation is universal as to grains of pollen and the sporangia of the cryptogamia.

GROWTH AND NOURISHMENT OF CELL MEMBRANES.

The original form of a young cell is subject to many transformations by the mode of its nourishment; for, naturally, with the growth of the contents the cell membrane grows also. When the cell extends itself equally in all directions, it acquires size without changing its original form. On the contrary, when it extends itself more in one direction than others, or if certain points on its periphery extend themselves predominantly, with its increasing size, it also changes its primitive form; and the diversified forms in which cells exist accord with the manner in which the cell membranes extended themselves. The growth of a cell is, however, often restricted in its freedom by neighboring cells. Its form then more or less subordinates itself to the existing cells. This is the case in all those tissues where the cells are compactly placed. The thickening of the walls, and the finally closing up of the cells is effected by the continual deposition of cellulose layers upon the inside of the membrane. The inmost layer, is therefore, always the youngest.

COMBINATION OF CELLS.

In only a comparatively few cases does a plant exist of a single cell—only in some fungi and algæ. On the contrary, in the higher plants the structure is a combination of several varieties of cells.

Cells can be classified into like and unlike. When like cells are united, we call the combination cellular tissue. But when unlike cells are united, we call the combination vascular tissue. Cellular tissue can be subdivided into wood tissue, bark tissue, bast, pith, foliage, etc.

The compound known under the general name parenchyma, is understood to apply only to the cellular tissue, as developed in the bark, pith, leaves, etc. By the vascular tissue is meant the combination of cells that are much, and sometimes indefinitely, elongated, and should properly be called ducts, such as convey the lactex or milky juice in the milkworts, the resins in coniferæ, etc. They are of varied structure, annular, spiral, cylindrical, etc. The cellular and vascular tissues are each united together by an intercellular substance, which is a transmuted product of the mother cell, and is the same as that which, on the surface of plants, is called cuticle or epidermis.

INTERCELLULAR SPACES.

Where the cells lie side by side, without being in contact at all points, there is a free space which is called an intercellular space. The more globu-

lar the cells, the smaller will be the superficial points of contact, and the larger the intercellular spaces, and also the more will the form of one cell be subordinated to another; and the more the walls mutually flatten each other, and the closer they lie side by side, the larger become the superficial points of contact and the smaller the intercellular spaces. The tissue formed of stellar shaped cells, therefore, has the greater intercellular spaces. These spaces generally are filled with air, and form in this wise a regular tissue of a more or less coherent system of intercellular passages, which discharge in larger air-filled spaces under the stomata or small orifices, also called breathing pores, in the leaves, or on the green bark of the stem.

In all tissue, while the cell-forming process continues, air is not found in the intercellular spaces; and in wood tissue the spaces are generally filled with the intercellular substance. But in those plants containing gum, resin, lactex, etc., the intercellular spaces are large and serve as ducts for these substances.

KINDS OF CELLS.

Cells can be divided into several distinct classes, according to their origin, the time of their appearance in the structure, as well as to their physical and physiological nature. The first general division is into free, and the second into combined cells.

To free cells belong the spores of the cryptogamia, and the pollen cells of the phænogamia.

To the combined or linked cells belong those named as constituting the different kinds of tissue already described. All cells that constitute an integral part of any structure, either of entire plants, as fungi, lichens, algæ, or parts of structure, as wood, cambium, bark, bast, etc., are combined cells. In the building of vegetable structure, the leagued, combined or linked cells play the most conspicuous part. Of these, the most widely distributed are the cells of the parenchyma.

PARENCHYMA.

The term parenchyma is applied to the substance constituting the cells of the pith, leaves, bark, medullary rays, etc. Parenchyma, like cellulose, is a mere transmuted production of starch. The cone or apex of any bud, whether of the seed, root, stem or axis, is always composed of it. Upon its presence depends the vitality of the bud, and consequently the life of the plant. Growth of a plant, in whatever direction, upward, downward or laterally, is an extension of parenchyma. The vitality of the parenchyma, or its power of extension, depends upon the presence of vibrionic particles in the extending cell. Viewed under a microscope, these vibrios have the appearance of bees swarming, moving rapidly in all directions on the apex of the fluid contents of the cell.

Both in the longitudinal extension of either the extending or descending axis, the structure is parenchyma, known under the familiar name of pith. The lateral extension, originating in, and radiating from, the pith, is known

as the medullary rays. The extension of the parenchyma thus produces the skeleton of the plant, on which all the other tissues form and build up its body. On the ascending axis nodes are formed, at which leaves develop, and generally a bud. The cells of the pith prepare the parenchyma for the development of the leaves, like those of the general structure do the cellulose for the cellular tissue. On the roots there is an analogous development, but no nodes or buds for new roots, and none to correspond with the leaves on the stem, unless it be the rootlets. These sometimes have been called spongioles, but the term is now discarded by physiological botanists.

The cells of the medullary rays, and those of the epidermis and bark, belong to the parenchymatous group. The medullary rays are seen in the radiating lines from the pith, through a cross section of wood, especially of oak. The rays are formed of compressed and often closed cells, that keep up communication between the interior of the stem and the bark, from the pith outward.

The cambium occupies the intermediate space between the wood proper and the bark. It is the last year's deposit of woody fiber, filled with starch, and endures only until the next annual layer is forming. The primary cells of the cambium layer spring from the secretions of the medullary rays, which seem to act chemically on the elaborated elements in the descending sap, transforming and fixing them as cambium. The cambium and the inner bark are main storehouses of starch and the azotized compounds, etc.

There is a distinction made between the cambium proper, which is a compact cellular and vascular tissue, and the cambium ring (*annulus cambialis*), which is a more open structure. The cambium ring is formed early in the season, as soon as vegetation commences. When the parenchyma in the cone of the stem, or of the radicle, begins to extend itself by growth in spring, the medullary rays similarly extend themselves laterally, pushing out, as it were, the bark, and forming new cells of mucilaginous matter on the outer surface of last year's cambium. It is on account of the delicacy of this structure that the bark so easily separates from the wood in spring and early summer.

The bark structure is not necessary to be analysed at present. I will, however, mention that portion of the outer bark which has a green envelop. The green matter that gives it this color is chlorophyl, and is the same that gives color to the leaves. The meaning of chlorophyl is leaf-green. In the leaf, however, it is not the leaf proper that has this color, but is the coating of minute starch granules, fixed to the interior of the cells, or floating in their sap, that gives the leaf apparently this color. The cuticle or epidermis has breathing pores (stomata), both on the stem and on the under side of the leaves, which bring the interior structure of the plant into communication with the atmosphere.

LEAVES.

The complete leaf consists of the blade and its petiole or leaf-stalk. The leaf might almost be said to be a thin layer of green bark, expanded horizontally. Like the stem, it consists of two distinct tissues, the cellular and

the woody. The cellular is the soft pulpy portion, the parenchyma, and only appearing green because of the immense number of starch granules in it, covered with chlorophyl. The woody portion are the ribs or veins of the leaf, which, like the woody portion of the stem, give firmness to the structure. The subdivision of these veins is carried beyond the limits of unassisted vision, so as to distribute to and receive sap from the minutest organs of the leaf.

The cells of the epidermis, both on the upper and lower side of the leaf, are placed horizontally and are very minute, sometimes small parallelograms, and consist but of a single layer. The cells under the upper epidermis are compactly arranged, and have their vertical diameter from three to five times greater than the horizontal. This layer consists of from two to four tiers of cells. Under and between these and the lower epidermis is a network of amorphous cells, arranged horizontally with large intercellular spaces.

I have now enumerated some, not all, but the most prominent, of the vegetable cells and organs, have described generally their development, and partly have indicated their function. The anatomy of the organic structure is now sufficient for our purpose. The organized plant is before us. It consists of two parts, the root and the stem. One forms nodes, out of which side branches may spring, and buds for continuing organic growth. The other forms no nodes, but new roots and rootlets spring from a peculiar development of the outer terminal cells of the medullary rays. The buds on the stem consist, however, of two kinds, the leaf or wood bud, and the flower fruit bud. From this I pass to the second division of the subject.

II. PHYSIOLOGY OF PLANTS.

The embryo of the future plant is nestled in the seed. The mother plant has stored in the seed lobes sufficient aliment, ready prepared, to sustain the plantlet in early life until it has acquired organs and vigor enough to take care of itself. Starch is the principal ingredient of the seed. But the embryo cannot digest starch until it is organized. "Strong meat for men, but milk for babes," holds good also in the vegetable world. The mother plant has therefore digested a part of the starch in degree, and a part completely, which latter is placed around the embryo, so that when the plantlet wakes up the food is within its reach. This is an introgeneous milk-like substance, called aleurone. Next to the aleurone stands the alluminoids; and between the latter and starch stands the albumin. They are all starch in different stages or degrees of digestion. If the seed has one seed-leaf only, it is said to belong to the monocotyledonous order of plants; if it has two lobes, to the diocotyledonous order. The function of the seed leaf is to act as digester of the starch until the store is exhausted and the plant organized. The embryo has two buds, and buds, we have already seen, consist of parenchymatous cells. The incipient development of these buds has received the name of germination. Warmth and moisture are necessary to germination. As a general thing, fresh seeds germinate sooner and more freely than old.

The seeds of many plants, if kept long, will soon pass the limits of germination. Coffee, for instance. Some seeds, like those of the maple, germinate as soon as favorable conditions supervene; others, on the contrary, lie some time in the earth, and generally do not germinate until the succeeding year. They seem to require time to become fully matured.

Germination is the commencement of cell formation at the apex of each bud of the embryo. One bud proceeds by pushing the ascending axis, the plumule, upward, to put it in communication with the light and air; the other, by thrusting the descending axis, the radicle, downward, to put it in communication with the water and alkaline salts of the earth. The plumule soon expands its leaves in the air, draws in life and vigor from the vivifying rays of the sun, rejoicing in its new being: It is now ready to be weaned, and be self-supporting. What are its means to effect this end? It has exhausted its store of food laid up in the seed lobes; it must, therefore, draw it from other sources, or perish. Whence and how does it supply itself? These questions will be answered when we treat of vegetable economy. All we can do now is to give the functions of its different organs, and the offices each performs in its individual economy.

ROOTS.

The roots, we have seen, put the plant in communication with the earth. They may be divided into two classes—first, the primary or tap root, which springs from the germinal cell of the embryo; and second, the secondary or side roots, springing from the sides of the tap root. As there are no nodes in the root, consequently it does not develop, like the stem, its branches from buds at the nodes. Branch roots, side roots, and rootlets, can spring from the sides of any main root at any point whatever. Nodes in the roots would be an impediment to the economy of the plant, for then only branches and rootlets could spring from buds at the nodes. The plant requires an organ at all points where the soil comes in contact with the roots, to gather food, which could not be the case if rootlets had to spring from nodes. This peculiar development of rootlets, therefore, enables the plant to put forth any number of them desirable, which it often does so as to cover the main root until it has a hairy appearance. The presence of parenchymatous cells is necessary for the development of branches, either on the stem or root. On the stem, the branches are formed only at nodes, where there is a ready organized bud; but the node itself is only a compact lateral development of parenchyma from the pith outward. The medullary rays, we have seen, are also a lateral development of parenchyma, permeating at all points and binding together the various tissues between the internodes of the stem. In the roots, these rays also bind the various tissues together, and form a connecting link between the bark and the pith. Instead of a root branching out from a regularly formed bud, as at a node on the stem, it springs from gemmation of the cell of a medullary ray. Something similar occurs on the stem when side limbs, known as water sprouts, develop.

The medullary rays of roots, besides multiplying roots and rootlets by gemmation, may develop new stems; as is the case in the root sprouting of the locust, cherry, plum, and some roses.

Roots, as a general thing, shun the light, and burying themselves in the earth, they seek there such food as the plant requires from the soil. The main roots fix the plant firmly to the earth, and their extensive ramifications lay a considerable area of the surface tributary to the nourishment of the plant. The younger portions only of the roots perform the functions of nutrition, and mainly by the innumerable fibrous rootlets they send out. These rootlets, seldom if ever branched, perish after performing their functions, but are constantly renewed.

CELLS.

The functions of the cells have already been partially indicated while describing their structure. First, cells may be regarded as digesters of the sap, transforming it into cellulose and parenchyma, for building up the skeleton of the organism, and for thickening and filling up the older cells, to give stability and firmness to the structure. Secondly, they are general digesters of the reserve elements in the plant, and of the crude elements taken up by the roots. Though cells are closed sacs, filled with fluid contents, yet there is a constant interchange of elements between them. In a state of rest, the contents of the cells may be, and probably are, homogeneous; but when vital action ensues, the transformation of the protoplasm into living organism, at such points where organic structure takes place, destroys the homogenity. This disturbs the equilibrium, and hence an interchange of elements ensues, to replace those consumed in building new structure.

DUCTS.

The structure known as vascular tissue should properly be called ducts. It consists of indefinitely elongated cells, of which the function is to conduct the fluid and gaseous elements taken up by the roots to every active cell in any portion of the organism. Hence they are of unequal length. Between them and the cell there is a similar interchange of elements as between the cells themselves. They also furnish the water with whatever it holds in solution to the cells, and from the latter receive the digested sap. Crude elements and digested sap seem each to have their appropriate ducts in the vascular tissue.

SPACES.

Intercellular spaces, though devoid of air, while cell formation in their proximity is progressing, when the structure is completed form air passages throughout the organism. In the milkworts these passages are filled with the lactex.

MEDULLARY RAYS.

The medullary rays branch off horizontally from the medullary sheath surrounding the pith. They keep up a communication laterally between the

pith and the bark, and perhaps also with the atmosphere. The annular or cambium ring is formed in spring by their action on the cellulose. In the latter part of the growing season, their action transforms the descending sap into starch, storing it up as formed in the cambium and alburnum.

BAST TISSUE.

The bast tissue is composed of the longest cells found in any tissue. Textile fibers, such as hemp and flax, belong to this tissue. The membranes are tougher, softer and more flexible than the cells of the woody tissue. Their toughness is proportioned to the length of the cells, but when short they are brittle. Where long, as in flax and hemp, they have great tenacity. They are the main channels of the descending sap, and elaborate from it various alkaloids, most likely with the concurrent action of the medullary rays.

LEAVES.

Leaves have been termed the lungs of the plant. If intended as a comparison of the functions performed, it is unfortunate, because it would lead to the inference that there was an analogy between the offices performed by the lungs of animals and the leaves of plants, while indeed there is very little. Lungs bring the blood, and leaves bring the sap, within the vitalizing influence of the atmosphere, and prepare them to build up vegetable and animal tissue. So far only the analogy holds good. But when we examine what takes place in the act of vitalization of each, we find it as opposite as the poles. In the lungs, the act of vitalization consists in the oxygenation of the blood; and the vital action in the animal organism ensuing therefrom decarbonizes organic matter to build up animal tissue. In the leaves, vitalization consists of deoxydating inorganic matter in the sap, and the vital action ensuing in the vegetable organism carbonizes the inorganic compounds before building up organic vegetable tissue. Moreover, the lungs of an animal draw not a particle of the nutriment from the air, while the leaves draw the greater portion of the nutriment for the plant from it. In the lungs, the mixture of veinous blood and chyle come in contact with the atmosphere, decomposing it, consuming the oxygen obtained, and exhaling the nitrogen and carbonic acid gas. In the leaves the digested sap decomposes the atmosphere, and the carbonic acid gas it holds in diffusion, consuming both the nitrogen and carbon obtained, and exhaling the oxygen. The leaf also decomposes water, to obtain hydrogen, which enters largely into the compound elaborated sap. The dynamical effect, in the correlating and conservation of force is also entirely different. The oxygenation and decarbonization effected by animals is the same as combustion; it liberates heat, while the deoxydation and carbonization effected by vegetation, imprisons heat. The analogy between the lungs and leaves, therefore, is very remote, and may be of use to assist us to understand the relative functions of each; but we must always bear in mind that it is by antithesis and not by harmony that the relation exists.

The inspissation of the sap also takes place in the leaves; first by exhalation of water, and secondly by its decomposition and the absorption of the

obtained hydrogen. The elaborated sap, when it quits the leaves, is, therefore, changed in its fluidity as well as chemical composition, suited to deposit in its downward course cambium, starch, gluten, alkaloids, etc.

III. VEGETABLE ECONOMY.

We have already seen that at the end of every stem, and at every node on it, there is a bud formed. These buds, in the economy of the plant, are either intended to perpetuate its life, or its species. The former are leaf, the latter flower buds. Flower buds only appear when the plant has attained or is approaching maturity. Diminution of nourishment, or impaired vital action, is supposed to be favorable to the development of flower buds. In trees and shrubs the flower buds appear on spurs, or beside the leaf bud. In herbs perishing annually, they supercede the leaf bud, or rather the latter is converted into a flower bud. The flower bud, therefore, is merely a leaf bud changed in form and function; and the leaves of the flower are but ordinary leaves changed in form and color. And as insects perform an important work in vegetable economy, in distributing pollen, the leaves of the corolla are colored for the purpose of guiding and attracting them.

STAMENS.

The stamens are only flower leaves that have still deviated farther from the normal leaf. In fact, they have deviated so far as to have lost the character of phænogamous leaves, and have acquired that of cryptogamous, by bearing sporangia. Stamens produce pollen, and if a pollen grain were self-proliferous it would differ in nothing from the spore of a cryptogamia.

PISTIL.

The pistil is a peculiar columnar prolongation of the parenchyma in the center of the flower. The pistil and stamens are called the organs of fructification.

The pistil has three subdivisions; the ovary, containing the ovules or rudimentary seeds; the style or columnar prolongation, and the stigma, which caps the style. A stamen has also three subdivisions; the filament, a thread-like stalk; the anther, capping the filament, and the pollen, a powdery substance, contained in the anther.

POLLEN.

Under the microscope, pollen grains have the appearance of spores; very often covered with protuberances not unlike the burr of the common Datura. Dissection shows the pollen grain to have two membranes; the outer, called *extine*, has an inflexible integument, and the inner, called *intine*, has a highly elastic integument. The intine is filled with fluid vegetable albumin, in which float innumerable particles of vibrionic matter called the fovillæ, which have an incessant molecular motion, like swarming bees.

The stigma has a moist network of cells, not covered by any epidermis, which receives the pollen. The cells of the stigma are tubes leading down

through the style into the ovary. The moisture of the stigma swells the pollen grain, bursting the inflexible extine and letting the intine escape. The latter then elongates down through the tubular cell of the style, and when it reaches the freer space of the ovary, swells out like a bladder, until it touches points where the ovules are attached to the embryonic sac. When the pollen cell touches this point a minute cell makes its appearance on the ovule, into which the fovillæ pass, and it has become a living cell.

GENERATION.

Vegetal generation is effected by the meeting of two cells of different origin; the pollen cell, containing the favillæ, and the embryonic sac, each filled with potentially vital matter. They coalesce, mingle their contents, and a new cell springs up, of actual vitality, out of which the individual plant is afterward developed. Endowed with vital force, and constituted an individuality, the embryonic cell commences its development. From its free end it elongates downward; minute granular matter appears in its interior, which before was perfectly clear and transparent. Soon transverse partitions appear, and the original cell is converted into a chain of cells, each having a distinct nucleus, the cytoblast. This first cell formation is by division of the original cell. After this chain of cells, as seen under the microscope, has obtained some length, the lower cell becomes globular, swells, its contents become turbid, and by gemmation develops a globular mass of cells. In the interior of this globular mass are first differentiated the plumule and radicle, as well as the parenchyma and cellulose.

After fertilization has taken place, the embryonic sac enlarges, and by secretion becomes filled with starch, gluten, oil, and the albuminoids. It is then called the seed.

After the maturity of the seed the vital force lays dormant until it is aroused by the intervention of heat and moisture, when it begins actual development into an organized, self-sustaining individuality of its parental type.

To enable it to develop, and to attain an organized structure, a supply of food was laid up for it by the mother plant, upon which it draws until the store is exhausted. These stores are generally starch, or compounds of identical composition and proportions, though there are some exceptions.

Plants of woody stems, such as trees and shrubs, come to rest after the exhaustion of the starch contained in the seed leaves and cotyledons, and make no further longitudinal growth that season. As far as I have observed, the peach is the only exception to this rule. It also comes to a rest and remains so, unless excited by cultivation and an abundant supply of air and nutriment. Under the latter favorable circumstances it will resume its longitudinal extension, and continue it until the close of the season.

In annuals and perennials whose herbaceous stems die annually, (unless the cotyledon leaves are converted into ærial leaves) the exhaustion of starch is also followed by a spell of languor or of more or less inactivity, when growth recommences with increased vigor.

ABSORPTION.

Every plant draws the elements of its nutrition either from the soil or from the air. Cells, we have seen, are closed on all sides, and the ends of the roots are covered with thin membranes, in which microscopes of the highest power have failed to detect any openings. How does the nutriment from the soil enter through this poreless membrane, and how is it transmitted and diffused through the cells after it enters? But first, what does enter, and what is its condition when it does so? The substances entering are lime, potash, silica, soda, magnesia, water, ammonia, carbonic, nitric and sulphuric acid, etc. The condition of the alkalies is, they are dissolved in water, and so is ammonia. Water, therefore, is the medium by which they are introduced within the organism. The acids are in the gaseous state. It is therefore evident that the plant cannot avail itself of any elements for nutrition, unless dissolved in water, or in a gaseous condition.

The transmission of matter dissolved in a liquid, or in a gaseous state, through closed membranes, is properly absorption. But on account of the movements started within the organism after their entrance for distribution and redistribution, it has been called by the scientific name of diosmose, which means impulsion through, from two Greek words, *dia*, through, and *mosos*, impulsion. Diosmose means impulsion through lengthwise; but there also are two impulsions sidewise. To that sidewise inwardly, the name endosmose has been given; and to that from the inward outwardly, exosmose. All these terms are borrowed from chemical and physical science, and when employed to designate chemical or physical phenomena are appropriate, but when used to designate physiological facts of life, in the absorption, distribution and nutrition of plants or animals, are of doubtful propriety. In physics, they mean only the reciprocal action and reaction of dissimilar dead matter, in juxtaposition. But if the vital force is nothing more than chemical action and reaction, then life itself is but another name for mechanical action.

Of life itself we know nothing, and can learn nothing, except what we can discover in its manifestations. In the manifestations of the vital force we can detect the presence of the cosmical forces, heat, light, electricity, magnetism, and chemical affinity, as the modes of motion. It is well known that the cosmical forces are convertible, one into the other, and that through the whole cycle of changes one is always the equivalent of the other. Motion, however, stands to them in the relation of genus, they being the species of motion. True, light, heat, electricity, magnetism and chemical affinity can all be converted into motion, and we know, also, that life is motion, but who has ever heard of converting heat, light, electricity, and so on, into life? Cosmical motion, and vital motion, then, are not convertible terms. Though every one is conscious that life is motion, yet he recognizes it also as something more. While, therefore, it is allowable to use mechanical terms to illustrate and explain the facts and phenomena of life, yet we must be careful not to be led ourselves, nor lead others, into materialism.

As already stated, in the manifestations of life we detect the presence of the cosmical forces. For instance, there can be no life without a definite amount of heat. By the law of its being, each living organism is so constituted that it can only exist within the limits of certain degrees of temperature. Within these limits there is a point of the highest vigor of vital action. If the temperature varies, either by increasing or decreasing from this point, vital action suffers, and will be destroyed if the variation proceeds to extremes in either direction. Like gravity, heat is an inexhaustible property of matter. Always radiating from all points of space, it is yet incapable of exhausting its sources. The ulterior law controlling its radiation is not known. But when any body receives heat, either by radiation or conduction, it develops in it positive, and when it loses heat by radiation, negative, thermo-electricity.

In fact, heat seems to be the active agent for developing electricity, magnetism and chemical affinity. Chemical affinity only acts upon matter in juxtaposition, but electricity and magnetism, if a proper medium is furnished, can travel and act at indefinite distances.

But heat travels everywhere, with or without a medium. Life, like the other forces, requires heat for its development, but it would be an unpardonable blunder therefore to assert its identity with them. The cosmical forces operating on inorganic elements produce merely inorganic compounds, but when acting under the controlling influences of the vital force from inorganic elements they form organic compounds and build up organic structure. It is therefore evident that, within a living organism, they are the servants of the vital force. While from necessity we are unable to explain the phenomena of plant nutrition without the operation of the cosmical forces, we must always keep in mind that their action is subordinated to a controlling force, the vital force over them, and not a mere mechanical action as in inorganic matter.

How far, then, can these forces be made available to explain nutrition and the various phenomena of plant life? Heat, the omnipresent force inherent in matter, must, in degree and intensity, accumulate in and around the embryo to start it into life and accompany it throughout all its future developments When heat fails, growth ceases. Heat, we have seen, also develops and brings into action the other cosmical forces. One of these is electricity, a species of which is galvanism. What evidence have we that either electric or galvanic action is taking place in vegetation? The leaves give out oxygen in the ozonic condition, the same as the electrodes of a galvanic battery. Whence comes this oxygen? The hydrocarbonates, of which the elaborated sap is composed, show that both water and carbonic acid have been decomposed to supply the hydrogen and carbon. There is no way of explaining these facts without admitting the presence of electric or galvanic action. Wherever there is electric action there are two opposite poles to the current. One of these poles is evidently in the leaves, for no chemical decomposition takes place in a galvanic current, except at the poles of the battery. Where, then, is the other pole? Unquestionably at the other extreme of the organism, at the points of the roots. Is there any evidence of galvanic action

around and about the roots? We know that the alkalies are not free in the earth, but form many compounds; many of which are insoluble in water, but are easily resolved under the action of a battery. The plant, manages, somehow, at all seasons, to get a full supply of these, when we know there is not water enough in the soil to act as a solvent. Admit galvanic action, and the whole mystery is explained.

Again, the medullary rays elaborate starch from the descending sap, and fix it in the cambium and alburnum. Galvanic action again explains this. So also the formation of the alkaloid crystals, as developed in the bast cells by the joint action of the bark and medullary rays. The motion of the protoplasm within the cell being alternately mutually repelled and attracted by the cytoblast, and the evolution of cellulose from the clear fluid of the cell, are all explainable upon the hypothesis of galvanic action. And so of many other phenomena in plant life.

It must also be borne in mind that, by the free interchange and transmission of the different elements of the cells, the alkalies and acidulous juices of the plant are constantly commingling; which alone, without any extraneous aid, would start a galvanic current.

The fact that the alkalies are not free in the soil, but bound up in various compounds, has already been stated. But supposing they were free, they are so distributed through the soil that it would be impossible to have rootlets enough to go out in search of them to collect them. Then, again, when collected, unless they were in juxtaposition with dissimilar elements with which they had affinity, they would be inert. But they are not inert. Here then is the difficulty. Since the roots are not numerous enough to search them out and collect them, then they must go to the roots. If the mountain will not go to Mahomet, then Mahomet must go to the mountain. How can this chemical inertia be broken up, so that each particle will move to the roots? If there is any known law by which this can be effected, then the whole difficulty vanishes.

Suppose we take a vessel filled with a diluted acid, holding some metal, gold for instance, in solution. We put in the vessel some metalic substance, and operate upon it by a galvanic battery. The gold held in solution by the acid will move to and be precipitated upon the metal, in other words, gild it. Suppose again, instead of putting the metal to be gilded directly into the acid, we put it into a bladder or series of bladders, filled with water or any liquid dissimilar to the acid. We again subject it to a galvanic current, and it is gilded the same as before. The galvanic current then has not only broken up the inertia of the gold held in suspension, but it has given it mechanical transportation, not only through the acid but through the animal integuments and the water. Hence we find that if we admit galvanic action in the roots we solve at once two difficulties. It will not only give transportation of the alkalies to the roots, but also through the membranes of the roots.

The question has been discussed, what gives the impulsion that makes the sap flow upward, as we find to be the case when in early spring a maple tree is wounded, and more especially in the bleeding of the grapevine? It is not

necessary here to present the explanations given to account for this fact, but merely to state that none are satisfactory.

There are many phenomena manifested in plant life to which science has not yet furnished adequate explanation. If any two of these phenomena can be satisfactorily explained by one and the same agency, the presumption is in favor of the explanation afforded by said agency. There is one phenomenon, that of a plant possessing, when the thermometer ranges low, a higher temperature than the surrounding atmosphere, or soil even, which has not been explained. Can any supposed agency be imagined that will effect both the upward flow of the sap and the excess of temperature?

Nitrogen is a chemical neutral, or rather negative. It enters directly into combination with no other element, but indirectly it forms the most powerful of all combinations. When other elements combine to form compounds, they, unless the compound occupies greater space than the constituent elements did, liberate heat. But when nitrogen enters into combinations it reverses this rule, it imprisons an enormous amount of heat, as is attested in gunpowder. The universal characteristic of nitrogenous compounds is their instability and easiness of dissolution by the least disturbing agent, often exploding with great violence—of which gunpower, guncotton, nitro-glycerine and dynamite are examples. Nitrogen, in the form of ammonia, is absorbed by the roots. Within the tissue starch is converted into the various forms of the albuminoid compounds, of which nitrogen is a component part. These again are transformed into the organic compounds cellulose and parenchyma, of which nitrogen is not a component part. In the breaking up of these nitrogenous compounds, may not the nitrogen, by explosion, or at least by expansion when it returns to the gaseous form, give this upward impulsion, while at the same time it liberates the heat it fixed in combining?

For every season the plant has its appropriate work. In the spring, when it wakes up after its long winter nap, it repeats the identical operation its embryo did when it woke up in the seed: it nourishes itself by assimilating the starch into cellulose and parenchyma, sending its roots downward and its branches upward, and adorning them with leaves and flowers. It then neither grows laterally, unless the cells of the cambium ring be called lateral growth, nor does it elaborate and store up starch for the next year. Its work then is, by the ascending sap, to assimilate the stores of starch deposited the previous year into cellulose and parenchyma. But the ascending sap builds no structure excepting the pith, the medullary sheath that surrounds it, the medullary rays, the cuticle and leaves. In old plants it also fills up the old cells with cellulose, converting the alburnum into duramen, that is, heart wood. On the contrary, the descending sap commences its work when the stores of starch are exhausted. It builds the cambium layer and new bast tissue, and from it, as already stated, the medullary rays elaborate starch and other isomeric compounds, storing them up in the cambium and sap wood, the richest stores of which, however, are in the roots. Crystals of the alkaloids, possessing the medicinal properties of the plant, and sometimes highly poisonous, are elaborated likewise by the liber in the bast cells.

The movement and function of the descending sap is so evident as to leave no room for doubt. If a branch of a tree is girdled in spring by removing the bark for an inch or so, that portion above the girdle will receive an abnormally large development of the cambium layer, a large store of starch and albuminoids, while below the girdle no cambium is deposited, and no starch elaborated and stored away. Moreover, the downward flow of the sap will push the cambium downward over the ring, and, if the latter is not too wide, will re-establish communication below it.

The building of cellular and vascular tissue by the ascending sap ceases about the summer solstice. The starch is then exhausted, and longitudinal growth comes to rest for the season. The plant is then organized, and it commences the work of enlargement laterally, and laying in provision for perpetuating its life. To this work, and to the ripening of its fruit and seed, it devotes the remainder of the season.

These are important facts in the economy of plants, which furnish many useful suggestions to the cultivator. When the starch is exhausted timber should be cut, for then it will afford but little food for borers. Starch, while it exists in the wood, is constantly being converted into albumen, which is a nitrogeneous compound, and unstable, like all such compounds. Albumen in wood, like the albumen in fresh meat, is the cause of rapid decay and decomposition. Timber cut when the starch, and consequently also the albumen, is exhausted, will have greater durability than when cut in winter, when full of starch. Again, starch is the provision stored up to develop new stems, roots and leaves the next season.

There is that foul troublesome weed, the horse nettle (*Solanum carolinensis*), which sends its perennial root down too deep for eradication. Exhaust it by continual hoeing down, so that it will have no supply of starch to start growth with the next year, and it will never appear again. In July is the best time for sprouting, because then no reserve of starch has been deposited to develop organisms in the future. You may smother the grass in your pastures the same way, by letting your stock crop it too closely when it is about replenishing its roots for the work of next year. Above all, you may ruin your timothy meadow by mowing before the leaves and stems have performed their functions in replenishing the roots, so that no new shoots will start either the same or the following year. That insensate summer pruning of the grapevine, which goes slashing in the vineyard in July and August, and which has very aptly been styled "summer slaughtering," is in violation of the laws of vegetable economy, and consequently followed with such direful results. I have seen a fine vineyard of Norton's Virginia completely exterminated by it in a single season. A knowledge of the laws of vegetable economy would have been worth thousands to its proprietor. A knowledge of the laws of vegetable economy may also be made available to increase the health, vigor and productiveness of plants, as well as their destruction. As we said at the beginning, the highest results of vegetable productiveness is not attained in a state of nature, either in quantity or in quality, but is brought about by the intelligent control of man. Man cannot control the laws of nature, and any attempt to do so must end in failure and destruction.

All he can do is to bring his operations to harmonize with, and to aid these laws. Sometimes his object may be destructive, as in the case of sprouts and weeds; but it is oftener to assist nature in attaining the highest results. In either case, to act intelligently, he must know what these laws are, and the mode of their operation.

As almost everybody is now planting grapevines, I will take the vine as an illustration.

The object of pruning it is to attain the highest degree of health and vigor, and at the same time the finest and largest quantity of fruit. How will the laws of vegetable economy aid him in his operations?

The vernal growth of all plants, we have seen, is effected by a mere assimilation of the starch stored up the previous year. The plant consumes, or rather transmutes, this, by extending its roots and branches, clothing the latter with bloom and foliage. When this is accomplished, its operations are all directed to provide for the future. Starch, we have seen, is laid up in the alburnum and roots, but more in the latter than in the former. Suppose that the vine demands one hundred square feet of leaf surface immersed in the air, to perform its vital functions healthfully. We give it no pruning; it expands a leaf surface to one hundred feet or more. The leaves are smaller and more crowded than if they had been intelligently distributed. Some of them are insufficiently aerated, and they sicken and die, in consequence of which the general constitutional vigor of the vine is affected. There are more bunches of fruit that can mature; they also suffer. When the fruit is matured the berries are small and the fruit is inferior. The vine also grows more and feebler canes than it can maintain in full vigor next year. This is the result that nature accomplishes unaided by the guiding, controlling hand of man. How can better results be attained both in healthfulness and fruitfulness? The intelligent vine dresser inspects the size and constitutional vigor of the vine. He estimates its capabilities for bearing fruit, and its wants for vigorous health, and prunes off whatever is redundant for either. The starch being in excess in the roots, what is cut off in pruning would not suffice for forming the new extension of leaf and branches on the excised canes. The pruned vine, finding itself curtailed in its dimensions, starts vigorously the buds on the remaining canes, putting out a branch and a bunch or more of bloom at each end. The vine dresser watches its operations, and, looking to the future, will not let the vine expend its energies in producing that which is superfluous, and which will have to be pruned off next year. For fruiting canes next year he wants a definite number, according to the vigor of the vine. If the vine starts more than he wants, he rubs off the surplus. On the fruiting canes of the present year he only wants healthy and adequate foliage enough to develop and perfect the fruit, and none to make surplus wood. Therefore, when a leaf or two has been developed beyond the last fruit bunch, he pinches off the extending cane. Thereby he husbands the resources of the vine. For, instead of exhausting itself in longitudinal extension and leaf building, it expends its vigor in developing the fruit and remaining leaves, both of which become abnormally large. The

leaf becomes, perhaps, twice as large as it would have been had longitudinal growth not been checked.

From the axils of the leaves laterals may start, which, after developing a leaf or two, are again pinched off. The result is large, healthy leaves, and not a crowded mass, exhausting and smothering each other, are developed in the immediate vicinity of the fruit, bringing it to the highest degree of perfection, while the cane on which it grows, and which is to be pruned off the next season, makes but little growth.

But how is it with the canes for fruiting next year? They are left to take their own course, unchecked by pruning, and develop an abundant supply of healthy, vigorous wood for the next year.

For the want of time, this illustration of the application of the principles of vegetable economy must suffice. There is, however, a mooted question about the best time to cut timothy for hay, which deserves a passing notice. There seem to be many notions about this, and each one has his own; but no one has ever tried to settle it upon a scientific basis. This is a question that can be settled by experiments conducted upon laws of vegetable economy. If timothy can only yield the highest results to man at the expense of its own life, then it ought not to be exacted of it. If it yields the best results to man when time is given to provide, not only for the perpetuation of its own life, but also for that of its species, then it ought to be known, to govern the operations of man. But at present neither is known.

To determine this, let equal areas of land be cut at different periods; one when in bloom, another intermediate, between the bloom and the full maturity of the seed, and one when the seed is fully ripe. Let the quantity obtained from each be weighed, both in the green and dry state, and let equal weights of hay of each be analyzed to ascertain the relative amount of nutriment in each. This will settle the question as to immediate profit. But let also the effects of cutting at each period be noted on the health and vigor of the roots. These experiments and observations will elicit facts that will fix, beyond controversy, the particular time for cutting hay.

The example of the culture of the vine, employed to illustrate the application of the principles of vegetable economy, has furnished the fact that culture, by directing and controlling the nourishment, effects a deviation in the fruit, making it larger, finer, and more delicious than in the normal wild state. Culture, for an indefinite number of generations, not only fixes this deviation, but begets still greater. Deviation correlates to the care bestowed to effect healthy and more vigorous growth, by directing the energies into proper channels, and supplying more abundant nutrition. All our cultivated fruits were in this manner, by a long series of years and careful selection, developed from unpromising, acrid, wild specimens. The wild pear, an extremely acerb fruit, is yet found in Europe and Asia. How long a term of cultivation it required to make it palatable is not known. But if Columella is to be believed, in his day the Roman Emperors, at their feasts, boiled it in wine to make it palatable.

Change in the external normal condition and nourishment has converted single rayed into double flowers, by converting the stamens, and sometimes

the disk flowers, into petals. The Dahlia and double Zinnia are recent examples of this law of vegetable economy. The tendency in all deviations is uniformly to increase by further propagation.

But deviations are not always improvements. The departure from the normal type may take an opposite direction, and may become a deterioration, and this deterioration may increase. The further propagation is carried on under the abnormal condition of cultivation. In Europe this is the case when some variation of nut trees are cultivated. Cultivation, sooner or later, induces not only deterioration but degeneration, which increases with the continuance of cultivation, while the wild trees never degenerate.

DISEASES.

Diseases of vegetation originate from disturbances or irregularities in the normal vital functions of the organs. They may be, like their causes, local or general; and may make their appearance in different ways, according to the nature of the disease or the plant it affects.

The primitive causes of all diseases are perhaps always found to be external. The changed circumstances, unfavorable to healthy growth, brought about by cultivation, is a fruitful source of plant disease. These and local causes may enfeeble the plant so that parasitic plants make their appearance on the vital tissue, as mildew and blight. Insects may select the succulent shoots and leaves for depositing their eggs, which develop galls and knots. But the most general diseases are sequences of violent meteorological changes, such as sudden, frequent and extreme changes of temperature, excessive moisture, or drouth, etc. Local causes of disease are less detrimental than those that are general. With the cessation of local causes, and the removal of the affected part, health returns. Sometimes these causes are within the control of man, but not always. The potato disease is caused by sudden and severe chilling and flooding while growing. The fungus that rots it is not the cause of the disease, but the consequences of it. It is the common *oidium lactis*, that merely seizes upon the dead matter of cells that have died, and decomposes it. The sweet exudation on the surface of leaves, known as honey dew, is supposed to be occasioned by the engorgement of the leaf cells during unfavorable conditions of the atmosphere for evaporation.

Many plants suffer if they have not sufficient light; others love the shade, and perish if exposed to the full glare of the sun. Some flourish even during long continued drouth, but soon perish in excessive moisture, and vice versa. One plant needs a high, another a low temperature. Some perish if the sap freezes, and others can withstand uninjured a temperature many degrees below zero. Though there is a great variation in the temperature that plants can bear, yet there is none that can endure the boiling point. One plant is indifferent to sudden and great variations of temperature, another perishes even in a little variation.

The cultivator of plants, it will be thus seen, must possess not only an intimate knowledge of the structure, function and economy of plants, but of their constitutional vigor, habits and power of endurance.

TIMBER GROWING.

A LECTURE BY O. B. GALUSHA.

The influence of forest trees upon the atmosphere, in purifying it by absorbing noxious gases, in equalizing its degrees of humidity, in softening the asperities of its temperature, in checking the force of its violent gales, so often destructive to growing crops and injurious to domestic animals, and thus securing a carpet of snow in winter to protect the roots of plants from the damaging effects of severe frost, are truths upon which nearly all men of science and observation are agreed; and certainly they are facts of so great importance that they should command the immediate attention of all dwellers upon the great western prairies. It does not come within the province of an essay upon "timber growing" to explain the principles in meteorology, electricity, chemistry and vegetable physiology, which operate to produce these important results. These subjects have been ably treated in other papers; yet we may and should consider the effects of these causes, inasmuch as they indicate to us the path of duty or economy in the direction of forest tree culture.

Foreign nations accuse the "Universal Yankee Nation" of being "slaves to the almighty dollar." That the American people are impatient of results, is a fact of every day's observation; and this, perhaps, justifies, in a measure at least, the opinion which the citizens of the old world entertain of us. The consideration of profit to ourselves, instead of benefit to posterity or ultimate good to the nation, has ever been too prominent among our incentives to action. But the time has come when we are called upon to prosecute enterprizes which look beyond the present generation for results. We must, for our own national salvation, look threatening disasters full in the face, and prepare to avert them. If we are to achieve and maintain our manifest destiny as the greatest and most prosperous people upon the globe, we must at once commence laying the foundations of this success. One of the important steps in this direction is the cultivation of trees for their climatic influences and for uses in the mechanic arts. The wide extent of our American prairies renders this work far more imperative upon us than it has formerly been upon the people of transatlantic countries; yet the history of many countries of the old world admonishes us of the folly of our present course of wholesale destruction of forests and neglect of planting new ones for the use of future generations.

The fact that our home groves are fast diminishing, without adequate efforts being put forth to make up for the loss, is apparent to all. But it is not generally realized to how great an extent the same is true of the pine regions of the North, from whence we now draw almost our entire supplies of timber and lumber for building purposes. Lumber is becoming dear each succeeding year, not, as has been generally supposed, from the high price of labor, so much as from the fact that the timber, at almost all points easy of access, is either thinned out or entirely used up, so that logs are now often drawn great distances to the rivers, and floated long journeys to reach those mills which,

a few years since, were supplied from adjoining forests. The amount of timber in portions of these vast pine regions has been greatly overestimated. I have traveled over and looked over hundreds of thousands of acres of these lands, extending from the southern point of Green Bay to Lake Superior, and am fully persuaded that two acres out of three, in this great territory, are either destitute of trees or covered with such varieties as are almost worthless. The fires which sweep over these vast plains, and through the forests, destroy the young trees, except here and there an isolated tract, so that we here find little or no provision for a supply when the present crop of trees is exhausted.

While we cannot prevent the destruction of our forests for the use and benfit of the present generation, we can and should take measures to create forests upon our farms, which will be ample to supply the wants of those who are to come after us. Comparatively little has as yet been done in this direction, and this little has been confined mainly to the cultivation of those varieties which are of rapid growth, and which would consequently bring the quickest returns. While these varieties are, perhaps, more profitable for artificial groves than most of the slower growing ones, yet it is highly important that a sufficient number of kinds should be grown to subserve all the purposes of the mechanic arts, and these arts call largely for the close, firm texture of the slower growing varieties. I am inclined to the opinion that the rate of growth in trees is generally underestimated, and am quite sure that comparatively few landholders realize that large profits would ultimately accrue from cultivating groves, even of the more moderate growing varieties. To illustrate the rate of spontaneous growth of such sorts I will cite an instance which has come under my own observation.

A few miles from my residence are a few acres of ground which were cleared of timber sixteen or seventeen years since. There was then left upon the ground a growth of underbrush only, consisting of several varieties of oak, hickory, ash, and some other sorts. I have watched the growth of timber there from year to year, until the present time, and am myself surprised at the result.

The land was worth, when cleared, perhaps twelve dollars per acre, not more. There have been taken from it, during the last seven years, poles equal in value, probably, to ten dollars per acre; and one hundred and fifty dollars per acre would hardly buy the trees now standing upon it. So that if we estimate the value of the land (at the time mentioned) at twelve dollars per acre, and compute the interest upon this for sixteen years, at six per cent., compound interest, adding the amount of taxes accruing during the time, with interest upon this at same rates, we have one hundred dollars per acre as the net profit of the timber crop, while, of course, the land itself has partaken of the generally enhanced value of surrounding real estate, and would now probably sell for fifty dollars per acre, were the timber removed.

A German friend, for whose integrity I can safely vouch, tells me that when he was a lad, and in his native country, his father had a tract of eighty acres of poor land, upon which he had tried in vain to raise remunerating crops. It was finally prepared in the best manner and planted with seeds of Nor-

way Spruce, which grow readily there in the open ground. These trees flourished, and, after a few years' cultivation, were left to themselves, thinning them out as they became crowded.

At ten to fifteen years' growth, immense numbers were sold, in thinning out, for hop poles and grape stakes. This tract is now a well timbered forest, from which fair sized saw-logs are cut, and every part of a house can be built with its timber.

These seeds were sown only thirty-six years ago! What would such a lot be worth upon the prairies of Illinois? Who would estimate its value at less than one thousand dollars per acre? What farmer upon the prairies of Illinois would wish to leave a better legacy to his sons? What has been done upon the poor hills of Germany, except starting the plants in open ground, may be repeated, and with equal or greater results, here, where all the hardy varieties of evergreen, as well as deciduous, trees grow luxuriantly.

The rates of growth in the more common varieties of trees may be observed by any one, and the time required to bring them to a size suitable for building purposes, and use in the various mechanic arts, easily calculated; thus the actual cost of raising timber may be very nearly ascertained.

Let us estimate the expense of raising a grove of ten acres, planted with white ash and black walnut—five acres with each. These varieties grow at about the same rate, and are about equally valuable for lumber.

The seeds of the ash, like all seeds of this class which ripen in the autumn, should be gathered when ripe, and kept in the cellar through winter. The walnuts, as other nuts, should be spread evenly upon the ground, where surface water will not stand, not more than two nuts in depth, and covered with two or three inches of mellow soil, that they may freeze during winter—to be planted as soon in spring as they show signs of sprouting. The land should be deeply plowed, late in fall if practicable, and finely pulverized in early spring, and marked both ways, as for corn, three feet eight inches apart. The tree seeds and nuts should be planted eleven feet apart, which will admit of two rows of corn or potatoes between each two rows of trees. By putting two or three seeds in a place—to be thinned out to one if both or all germinate—an even stand may be secured. A better way is to plant in rows, eleven feet apart, running north and south, and three feet eight inches (in the marks for corn.) This will secure straight trees—being closer—and they may be thinned out to eleven feet each way when large enough to use for grape stakes, bean or hop poles. This will give three hundred and sixty trees per acre, or three thousand trees in all, allowing for sixty vacancies, though in all cases of tree planting, whether in groves or screens, a supply of good plants, grown elsewhere, should always be in readiness to use in filling vacancies, which should be done at the end of the first year.

The preparation of the ten acres of ground, at five dollars per acre, would be fifty dollars. Average cost of seed, fifty cents per acre, five dollars. Planting, twenty-five dollars. The cultivation during the first five years will be paid for in the crops grown between rows. For cultivation from fifth to ninth years—four years—with horses only—thirty dollars per year, one hundred and twenty dollars. After this time no cultivation or care will be

needed. This makes the entire cost, in seed and labor, of the ten acres of trees, two hundred dollars. These trees will, at twenty-five years of age, average sixteen inches in diameter at the ground, and about ten inches at the height of sixteen feet. This will give, deducting waste in sawing, one hundred and twenty feet of lumber per tree. Allowing one-sixth for damage by the elements and loss from other causes, we have in round numbers three hundred and sixty thousand feet of lumber, which, at fifty dollars per thousand, would amount to eighteen thousand dollars. The value of the tree tops for fuel would be equal to the cost of preparing the logs for the mill, and the expense in sawing would not exceed five dollars per thousand feet. This, added to the cost of producing the trees, and the amount deducted from the value of the lumber, leaves *sixteen thousand dollars for the use of ten acres of land for twenty-five years*, and the interest upon the amount expended in planting and cultivating the trees! This statement may be deemed incredible, perhaps, by those who have not previously turned their attention to the subject, but after much study and many years observation and measurements of growths of different varieties of trees, I am convinced that in all well conducted experiments in growing artificial groves upon our large prairies, the profits will not fall far, if at all, short of the rates above stated. It must be borne in mind that trees standing at regular and proper distances upon rich prairie soil, and receiving good cultivation, will grow much faster than the same varieties usually found growing in natural groves. For a list of varieties suitable for planting in artificial groves, I would refer all interested to the lists recommended by our State Horticultural Society, with the remark that the planter can hardly be in error in planting any tree which is indigenous in a soil and climate similar to his own; while many trees, whose native homes are found in latitude north or south, have thus far proved valuable, as the Osage Orange and Catalpa, from the South, and the Red Pine and White Spruce, and others, from the North.

Some foreign varieties are equal or superior to any of our natives; among which are European or Scotch Larch (best of all foreign deciduous trees), Austrian and Scotch Pines, Norway Spruce and White Willow.

I regard this last as probably combining more desirable qualities for cultivation in groves for lumber purposes than any other variety of the soft wood, rapid growing deciduous trees, and am decidedly of the opinion that this and the golden variety are the best deciduous trees within my knowledge for wind-breaks or screens, but wish to be distinctly understood as not recommending this tree as a "hedge plant," or the planting of this or any other one sort to the neglect of other desirable varieties. Strong cuttings of this tree seldom fail to strike root at once in mellow soil, and will make a growth of from two to six feet the first season. It thrives in all kinds of soil, making as much wood in a given number of years as any other known sort, not even excepting the cotton wood, growing into a large tree, sometimes four feet in diameter. The wood is of rather fine texture for a light wood, making a fair article of soft lumber, which bears a fine polish. It is also valuable for making wooden ware, bowls, trays, etc. It also splits freely, which is a desirable quality in making fence posts, rails, railroad ties, and fire-wood. I

would here remark that it is more than probable that before five years are past the present mode of infusing the gasses of coal tar into the pores of timber will be so improved, or some other method, that soft and porous wood will be rendered almost indestructible, and at a trifling expense. If any Professor or student in this University would accomplish this achievement, he would confer a blessing upon the State which would repay an hundredfold all the expense of establishing and maintaining it.

The golden willow is similar in growth and texture to the white, but I think does not make so large a tree. I have measured about a dozen trees of this variety (golden) which were planted by the road side fifteen years ago last spring, and find the average circumference of the trunks, at three and a half feet from the ground, to be five feet and three inches. A white willow, standing near my house, which has grown from a small cutting put in thirteen years ago last spring, now measures six feet and two inches in circumference near the ground, forming a head or top thirty feet across. This variety, when planted in groves, grows tall and almost perfectly straight.

I have carefully computed the expenses of raising ten acres of trees of this variety, and converting them into lumber and find the entire cost not to exceed ten dollars per thousand feet.

This estimate is based upon actual measurement of the growth of trees. The land is valued at forty dollars per acre, with interest upon this amount, together with expenses, computed as before, at six per cent. compound interest.

I take ten acres in these estimates of growing artificial groves because it is desirable to have trees enough together, or in close proximity, that the cost of putting up and removing a saw mill would be but a trifle upon each thousand feet of lumber sawed.

TIMBER BELTS.

The actual profits which would accrue from a general and uniform system of cultivating trees in belts, or double rows, for protection, cannot as readily be estimated; yet no one who has carefully investigated this subject can doubt the utility and economy of such screens. To show the possible extent of their beneficial influence, I will call up an instance which, probably, very many of this audience will remember.

In the year 1862, at the time when spring wheat and oats, in the northern portion of the State were just past the bloom, and a portion of the grains in the milky state, we were visited by a storm from the northwest, which swept over this portion of the State, prostrating nearly all the grain not sheltered by timber.

I have selected this instance as an illustration, because of the extent of the storm, and also on account of the marked effects of protection by timber in this storm, which clearly showed that the entire loss might have been prevented by belts of trees. In one locality a single line of broad and tall willows, closely planted, proved a sufficient check to the wind, so that a field of wheat adjoining it upon the east stood erect, and was harvested with a ma-

chine, while in exposed situations, the shrunken grain, if saved at all, was often gathered by the slow and tedious process of hooking it up with scythes. Many thousands of acres were left to dry, and were burned upon the ground, which two or three weeks before harvest promised abundant crops. The extra expense of gathering the grain of that harvest could not have been less than fifty cents per acre on the whole amount harvested.

I traveled quite extensively over this portion of the State before and soon after the harvest of that year, and am convinced that one-half the value of the wheat and oats in the territory passed over by that storm was destroyed by it.

There were sown in that year, as per census reports, in the thirty counties lying north of the Burlington, Peoria and Logansport Railroad, about one million two hundred thousand acres of wheat, and at least one-fourth as many of oats. Allowing one-tenth of these crops to have been protected by timber, we find the loss to have been equal to five hundred and forty thousand acres of wheat, and one hundred and thirty thousand acres of oats.

Computing the wheat at fifteen bushels per acre, and the value at fifty cents per bushel; the oats at thirty bushels per acre, and price twenty cents per bushel, we have the sum of four millions eight hundred and sixty thousand dollars, as the cash value of property in these two crops alone, which was destroyed in a single storm in an area of a little more than one-third of our State.

Allowing one hundred and fifty thousand acres to have been burned, or not harvested, and adding to the amount of loss fifty cents per acre of the remainder of the nine-tenths (lodged grain), equal to six hundred thousand dollars, it swells the amount to the enormous sum of five million four hundred and sixty thousand dollars.

Let us see how much it would cost to plant and cultivate screens to prevent such losses. A double row of white or golden willows, with trees in the second row set opposite the spaces in the first, planted upon the west side of every eighty acre lot, would doubtless prove sufficient, as they would, at the age of twelve years, form a dense wall of foliage about forty feet high, and would of course increase in size for many years thereafter.

These would cost, per mile of screen, about as follows: Average value of two acres of land, forty dollars per acre, eighty dollars; preparation of the soil, and planting with strong cuttings, ten dollars; cultivating the first two years, twenty dollars; making a total cost, with purchase money of the land, one hundred and ten dollars. After two years no care will be needed, save a mulch of refuse straw, to be renewed once in two or three years, the cost of which will be more than repaid in the partial protection which the trees will render previous to the twelfth year.

There are, in the thirty counties referred to, about sixteen thousand six hundred and twenty-five sections of prairie land. This will require sixty-six thousand five hundred miles of screen, if planted as above proposed, making the entire cost seven million three hundred and fifteen thousand dollars. Thus we see that, without estimating the immense damage done to fruit and other crops, the wheat and oats destroyed in that storm would, if saved, have

paid about three-fourths the entire expense of growing timber belts throughout that entire territory!

I think it may be safely estimated that an average of one-twelfth part of all our crops of grain and large fruits are destroyed by violent winds, which such a system of protection, or its equivalent in groves, would so far check as to prevent the destruction. If this is true, such protection would save to the husbandmen and orchardists its entire cost every two, or, at most, three years. Such protection, too, would, by causing the snow to remain spread evenly over the surface of the ground, as before hinted, enable the farmer to raise winter wheat in localities where it is now impossible to do so.

If we add to the benefits of tree culture already considered, those far-reaching and incalculably valuable climatic influences which would flow therefrom, we must all admit the necessity of commencing this great enterprise at once, and prosecuting it with vigor.

I do not introduce this plan of planting straight belts of trees, a quarter of a mile apart, because it is the most desirable plan which can be adopted, for no man of taste would regard it as such. The eye would soon tire of such stiffness and monotony in the landscape. Tree planting may be so planned and conducted as to give beauty to the landscape, and at the same time secure nearly all the combined benefits of protection to crops, timber for uses in the mechanic arts, and those climatic influences which we all regard as so important. Of course no rules can be given for such tree planting. Generally, where the surface is somewhat undulating (for we have no hills), the planting should be done mainly upon the higher portions of the farms, and along the water courses. Where the surface is level, belts may be planted upon the north and west of the farms, with groves upon the least valuable portions. These last would intercept the straight lines and give diversity. But if each prairie farmer were to follow his own taste, or adapt his planting to secure the greatest profit in timber or protection to his own farm, planting about one-tenth of his land with trees, it is probable that all the desirable ends which we have been considering will be gained, and the landscape sufficiently diversified to be pleasing to the eye.

Here, then, brother farmers, and farmer students in this University, we have two pictures presented to us. In the one we look into the future and see wide spread desolation—an extended treeless country, visited by destructive storms, by severe drouths, with its streams dried up, and food for man and beast in such scarcity that the poor can scarcely obtain a supply. In the other we see a charming landscape, a rich, fertile country, a population enjoying all the blessings which flow from peace and plenty.

Which will you choose? Will we take warning in time, and arouse ourselves to action in an enterprise which promises such rich results?

DISCUSSION.

Mr. MINER—I have given some attention for nineteen years past to growing timber. I plant the walnut. I differ with the

speaker in regard to the time of planting. I gather them in the fall of the year and plant immediately. I strike off furrows with the plow, and plant them without taking the hull off, and the work is done. I do not see anything gained in laying the nuts away in the cellar and planting next spring.

Mr. GALUSHA—The only gain that I see is to have the ground in readiness to grow other crops between. We get a more even stand planted in the spring.

Mr. FREEMAN—It is well known that the nuts require frost and moisture in order to force them open. By the speaker's plan you can get a better stand, especially if you assort the nuts. By this means you get a more uniform stand in your plantation.

Mr. MINER—I still think my plan has some advantage. In the fall the ground is dry, and we have more leisure to do the work. In the spring the ground is wet, and is not in so good a condition as in the fall. I have no trouble to know when my walnut trees are in the row. Here in Illinois (take my own case) we have a great deal to do, and if this work is not done in the fall it will in all probability be neglected. If I were going to plant more trees, as I probably shall, I would plant in the fall. I now have planted and growing groves of cottonwood, walnut, sycamore, wild cherry, maple, the sugar tree, osage orange, and some crab apple. I am an advocate of tree planting.

Mr. ROBINSON—I wish to ask what is the value of the European Larch as to durability?

Mr. GALUSHA—So far as we know it we have everything in its favor as to its durability. This tree and the white willow stand at the head in this respect, and greater profits are realized from growing groves of the European Larch than any tree next to the white willow. I would ask if the gentleman has had any experience in growing the soft maple, and whether his trees are troubled with the borer?

Mr. MINER—I have never been troubled with the borer in my maples. I have the trees three years old. My black locusts are destroyed entirely.

Dr. WARDER—How soon are your locust trees attacked by the borer?

Mr. MINER—At two or three years old. I planted them fourteen years ago.

Mr. ROBINSON said that he planted locust trees, and the borer destroyed them.

Dr. WARDER—I see there are some very fine trees here in Champaign. Has any one seen the borer attack this tree in the first year?

Mr. ROBINSON—Not the first year, but I have seen them attack it the second year.

Mr. LUDLOW—I have made several efforts to grow this tree. The first year this tree grows thrifty, and the second year the borer attacks it.

Mr. H. DUNLAP—I have seen them working upon the sprouts of one year's growth.

Mr. MINER—Does Dr. Warder say that these trees in Champaign are free from the borer?

Dr. WARDER—I saw them only at a distance. They looked thrifty and well.

Mr. ROBINSON—It appears to me that as much can be done by preserving the young growth that is coming up as in planting. We know there are many places and large tracts of country where a judicious thinning of the thick undergrowth would be all that would be required in growing extensive and valuable forests. The expenses of thinning would be met in the amount of firewood obtained. The thinning out will induce stronger and more rapid growth, and consequently more durable timber. We know that timber that has made rapid growth—a strong burr oak for example—put in as a fence post, will last twice as long as timber that has become brash from slow growth. Timber grown in a crowded, damp place is nothing like as good as that which has room and light in which to develop strength.

Mr. STEWART introduced the subject of birds. They were pecking holes, and pecking to death his trees, and he wanted to know what the Institute was going to do about it, and wanted to know in particular if it was the sap sucker.

Mr. GALUSHA said that he would know the bird by the shape of its tongue; no other bird has such a tongue. They have a wedge-shaped tongue.

QUESTION—What is the remedy against the bird?

ANSWER—Shot.

Then said one, who supposed the bird was after the worms, and in particular the borer, what is the remedy for the borer?

Mr. H. J. DUNLAP said he knew not how the gentleman would obtain the desired information, except by subscribing for the American Entomologist, published at St. Louis. [Laughter.]

Mr. LUDLOW—I would like to ask Mr. Galusha if he has any knowledge of the mulberry tree, as to its durability for posts?

Mr. GALUSHA—I have never known the mulberry grown for posts. There is a tree that will be grown for posts, that is the osage orange. Also, another tree, the catalpa, will be grown for the same purpose. But the osage hedge will be best.

Mr. MINER—I have a few osage standing in my nursery. They are not likely to make posts.

Mr. PERIAM—They must have high dry land. They will not stand excessive wetness.

Mr. ROBINSON—All trees will branch out if left scattering. It is desirable that, for posts, they should have straight trunks. We have the coffee nut tree, which I think makes good posts. It is a free growing tree and splits well.

A VOICE—Is it not the same as the horse chestnut?

Mr. ROBINSON—It is altogether different. It has a property that no other wood has, that is, the property of not shrinking in a green state, and can be used for cog wheels.

Mr. GALUSHA—I would like to know the value of the chestnut tree. I find it does well on high rolling ground, not on wet.

Mr. ROBINSON—There are some large trees in Tazewell county. They make very rapid growth.

Mr. PARKS asked if the silver leaf maples, growing upon the bottoms, furnished good seed. That is, are they the true silver leaf maple?

Mr. GALUSHA—They are. You get the true variety.

APPENDIX.

The following documents are the memorial to the Legislature alluded to on pages 48, 55, 58 and 59, and the appropriation bill as it finally became a law. Comparing the two, we find the following results:

App. for	Asked.	Granted.
Agricultural Dep't	$38,000	$25,000
Horticultural "	22,000	20,000
Mechanical "	40,000	.....
Chemical "	30,000	5,000
Apparatus, etc	25,000	10,000
Drill Hall	15,000	.....
Total	$170,000	$60,000

MEMORIAL

TO THE HONORABLE MEMBERS OF THE LEGISLATURE OF ILLINOIS, FOR THE SESSION OF 1869.

GENTLEMEN: The Trustees of the Illinois Industrial University, at their recent meeting, appointed a committee to address to you a memorial in regard to the condition and wants of this new State Institution.

It is not necessary to recount to you the prominent part taken by eminent citizens of this State, in securing the grant of public lands for industrial education; nor the almost unprecedented liberality of the citizens of the several sections of the State, in the bids made to secure the location of the University. Never have the people of a state exhibited a higher or broader interest in the foundation of an institution of learning, than the people of Illinois in this.

CONDITIONS OF THE GRANT.

The State, in accepting from Congress the immense gift of 480,000 acres of land scrip, deliberately assented to all the conditions of the grant, and assumed all the responsibilities it imposed. These conditions included the inviolability of the fund and its interest, its perpetual security against loss, the payment by the State of all expenses for its management and disbursement, and, by unavoidable implication, the support and maintenance forever, with its aid, of such an institution as the act describes.

Thus far the State has exhibited much wisdom in the management of this great trust. By wisely appealing to the public emulation of its several counties, it secured for the institution buildings, farms, and other property of great value, without expense to the State, and without diminution of the funds.

A NEW OBLIGATION.

But this generosity of its citizens has only added a fresh obligation to those which the acceptance of the grant imposed upon the State. The pledges made to Congress the State has now repeated to its own citizens. It was for no private or local institution that the several counties bid such princely sums. It was for a University belonging inalienably to the State, and for whose perpetuity and success the faith of the State was irrevocably pledged, that the tax-payers of the several counties were encouraged to vote upon themselves the burden of so gigantic a donation. The State cannot, in justice, and will not, if wise, attempt to thrust upon other hands a duty it voluntarily took upon itself.

ACTS OF THE TRUSTEES.

The Board of Trustees appointed by the State, obeying the mandate of the Legislature, located the University at Urbana, the county of Champaign having, in good faith, paid over its offered donation.

A full statement of the further doings of the Board will be laid before you in the annual report of the Corresponding Secretary. The Trustees have aimed steadily to carry into effect the laws of Congress and of the State Legislature. Acting, as they ought, for the whole State, they have sought to organize the University on a basis worthy the State itself, and of the great public interests involved. Large expenditures were found necessary to alter and fit up the University building for use, to grade and fence the grounds, and to purchase the additional lands, and the teams and tools needful for the present purposes of the institution. These expenditures have been carefully confined to the supply of immediate wants. It has been the policy to diminish as little as possible the permanent funds, in the hope that the University may ultimately be supported mainly, if not entirely, by the income of these funds.

PRESENT FUNDS AND INCOME.

The endowment fund of the University, derived from sale of scrip and from the unexpended balance of Champaign county bonds, is $309,000. The annual interest of this fund is $25,290. About 25,000 acres of lands have been located with the scrip, and 75,000 acres of scrip remain to be disposed of.

The expenditures during the first year, ending March 11, 1868, amounted to $35,076 90, of which $22,693 83 were for purchases of additional lands and for permanent improvements in buildings and grounds, and $2,951 80 for expenses of sale and location of scrip.

The expenditures for the current year will exceed $30,000. It is evident that the income, even when swelled to the utmost by the final sale of the scrip and lands, will be all required to meet the ordinary expenses of the University, and will be much less than that of many institutions with which it must come into competition for both teachers and students.

FUNDS NEEDED FOR OUTFIT.

It early became apparent to the Trustees and others, that a full outfit for the several departments could not be afforded from the ordinary income of the University. The peculiar character of its industrial departments, and its extensive scientific courses, entail upon it much larger expenditures than those of an ordinary college. Its farms, gardens, machinery, cabinets and apparatus will all cost heavily at the outset.

To leave these industrial departments to struggle forward without the necessary facilities for their work, is to doom them to certain failure, and to defeat the aims of Congress and the just hopes of the friends of Industrial Education.

It seems, therefore, the evident duty of the Trustees who have been appointed by the State to watch over this great interest, to lay its wants before you, the representatives of the authority of the State, and the guardians of its interests, and ask from you such action as the case demands.

APPROPRIATIONS REQUIRED.

Appropriations are needed as follows:

1. For the *Agricultural Department.* For barns and other farm buildings for the experimental and stock farms; for houses for farmer and farm laborers; for fences, drainage, wells, windmill, teams, tools, seeds, roads, bridges, shelter and fruit trees, and for stock of several breeds and varieties, $38,000.

2. For the *Horticultural Department.* For horticultural buildings and structures; for house for gardener; for barn and tool house; for teams and implements; for fences, underdraining and roads; for fruit and forest trees for the orchards, forest tree plantations and shelter belts, and for shrubs, plants and seeds of all sorts, $23,000.

3. For the *Mechanical Department.* Whatever may be done at branch institutions, the Trustees regard it as vitally important that some considerable

development shall be given to this department here at the central institution. Even the students of agriculture will need to know the theory of machines, and to understand especially the construction and management of that rapidly increasing array of machinery in use on the farms. For this department there is asked, for shops, tools, machinery, models and drawings, and for lecture rooms and drafting rooms, $40,000.

4. Apparatus of instruction for the several departments. For apparatus, philosophical, engineering, physiological, botanical, veterinary, etc., and for books, charts, cabinets, cabinet cases, models, plans, etc., $25,000.

The high importance of the chemical department, and its broad fundamental relations to agriculture and to all the industrial arts, demand that it shall be furnished not only with ample lecture rooms, but with working laboratories, in which large classes of students shall be accommodated with facilities for practical work in the several departments of analytical chemistry and mineralogy. There will be needed, for such purpose, about $30,000.

There is also greatly needed a drill hall, for the military and other exercises in inclement weather and in the winter season. The importance of such a building has been acknowledged everywhere, and most of the older institutions are now provided with gymnasiums. In our State, where the nature of the soil almost forbids outdoor exercise during so much of the winter and spring months, this is doubly important, and the military tactics required by Congress can scarcely be taught without it. It is estimated that it will cost $15,000.

A detailed statement of the several items of each appropriation has been carefully prepared, and will be presented to the appropriate committees.

REASONS.

The reasonableness of the amounts of these several appropriations will appear to any one who has even a slight acquaintance with the cost of institutions of higher learning. Their necessity is absolute. The University cannot go successfully forward without them. Our people will neither honor nor patronize an institution of mean proportions and cheap appointments.

No intelligent agriculturist or horticulturist will think too much is asked to furnish the gardens, orchards and farms on which the great problems in agriculture, in all its branches, and in horticulture, fruit growing and tree planting, are to be investigated and taught for the benefit of these gigantic interests in this great State. An interest which, in 1866, had already invested in cultivated farms and live stock over $400,000,000, and yielded, in its annual production of grass, grain and roots, $160,148,704, may certainly ask so small a sum as is here asked for the cultivation of the science and skill needed for its successful control.

And it should be remembered that the experimental farms and gardens are to be conducted quite as much for the promotion and diffusion of agricultural science throughout the State, as for the mere purposes of instruction inside the University. It would require but a very few acres to illustrate to the student the several processes of husbandry as already known, but to carry on a full series of experiments in field crops, fruit growing, tree planting and

stock rearing, for the benefit of these great industries throughout Illinois, will amply occupy 600 acres, or even the 1,000 acres accepted by the State for this use from Champaign county.

The Hon. John P. Reynolds says, in his report on the Paris Exposition: "Almost all important efforts and experiments in Europe, the result of which has been to improve agricultural practice and increase production, have originated with the governments, or in special schools, maintained in whole or in part by government patronage, as necessary measures of political economy."

The sum asked for the mechanical department is moderate, when compared with the amount given by Massachusetts to her Institute of Technology, and with the immense value of this department to our great manufacturing interests still in their infancy, but already, in 1865, amounting in their annual products to $63,356,013. It is to their schools of this sort that France, Belgium and the German States owe their supremacy in manufactures. In the great Paris Exposition of 1866, England found herself beaten, at almost every point, by the French artisans, trained in the great Polytechnic schools of France. If Illinois shall ever compete successfully with New England in manufactures, we must do it by brain power, by minds trained to understand and direct machinery and manufacturing processes. Educated mechanics will do more than tariffs to introduce manufactures throughout our State.

The appropriation asked for the various apparatus of instruction amounts to only one-fourth of the sum lately expended by the Cornell University for these purposes, and there is no prominent college or university in the country that has not much larger sums than this invested in cabinets and libraries. Not one of the appropriations asked for is more vital to the real work and power of the University than this, and if the amount were $100,000 it would be a most wise expenditure. Apparatus teaches to the sight, and trains the student to use his own eyes, and to become a keen observer of the more magnificent apparatus with which God continually teaches those who can learn, in the great school of nature. Years of hard, and often fruitless, study can often be saved our youth by good instruments of instruction.

The entire amount asked for all purposes is but trifling when spread over the taxable property of the State. It is less than one-thirtieth of one per cent. The amount asked for the agricultural and horticultural departments is less than two mills for each acre of land in the State.

IT WILL PAY.

If the University shall lead to the discovery of new methods, or diffuse more widely those already known, and thus teach how to raise one bushel of corn more from each acre planted than was raised per acre in 1866, it would, at forty cents a bushel, add more than $1,000,000 to the annual harvest of the State.

If, by stimulating and directing the taste and skill of the farmers of the State to new cultures and better methods, it could add only *one per cent.* to the annual farm products, over those of 1866, it would increase the production $1,600,000.

It is asserted that noxious insects destroy, annually, over $20,000,000 in fruits, trees and grain. If the University shall teach how to avoid the ravages of a single species, it will save more than the entire cost of the institution.

If its experiments, widely published, shall save the farmers and fruit growers from useless experiments with worthless fruits, grains and trees, it will save annually to the State hundreds of thousands of dollars now wasted.

If its influence shall increase the tree planting throughout the state, it will give back in the wealth, and health and beauty of the State a hundred times all it now asks to carry out its plans.

If its mechanic shops shall stimulate the inventive genius of a single inventor of agricultural or other machinery, like the horse cultivator, rake or reaper, it will open a perpetual source of wealth.

If it shall help to develop our manufactures as such institutions have done, it will, like pumps sunk in deep wells, give out in perpetual streams what it asks now in quarts.

If it shall help to save the rich soil of our State from ultimate exhaustion by bad and wasteful husbandry, or shall teach how to bring under tillage lands now worthless or shall incite to a saving of the millions worth of manures now left to be wasted, how immense will be the returns it will yield for coming ages.

Nor are all these mere baseless suppositions. We are fully authorized by the past history of industrial schools to aver that this, if liberally fostered, will help to enrich the State a thousand fold more than all its costs.

While other appropriations are asked by charity or extorted by crimes, and are gifts from which no returns are asked, this is an *investment*, in the industrial fields and forces of the State, and will pay back every ten years all it asks. A million of dollars spent in this way would be wisely laid out, and would glorify and enrich the State beyond computation, and for ages to come.

ACTION OF OTHER STATES.

The liberality exhibited by other states, and by some of those of far less power and wealth than our own, encourages the Trustees to hope that a wise and liberal policy will be pursued towards the University. Pennsylvania appropriated to its Agricultural College $200,000. New York gives to Cornell University $18,000 a year, after having given it 900,000 acres of Agricultural College Land Scrip, to which Mr. Cornell has added about $800,000. That state also gives to the Renssalaer Polytechnic school $15,000 a year, and nearly $40,000 to other colleges. Massachusetts has given to the new Agricultural College of that state $91,000, to the School of Technology $262,444, and to the Museum of Zoology $180,708. It has also given to Harvard and to other colleges, within ten years, $128,500. The total gifts to Harvard amount to $215,797 73. Michigan has appropriated to its Agricultural College $198,398, besides large donations of state lands. It has also given to its State University $100,000, and now tenders it the income of a tax which will yield $15,000 a year, and this although its endowments already afford nearly $40,000 per annum. Wisconsin has given to the agricultural department of its State University $30,798 50, and to the University itself $27,594 84, and now gives it $7,303 76 annually.

The following tabular statement exhibits the sums paid to higher institutions of learning by the states whose statistics have come to hand:

States.	To Colleges and Universities.	To Agricultural and Polytechnic Schools.	To Normal Schools.
Maine	$34,000 and lands.		
Massachusetts	$344,297 73.	$534,152.	$193,400 in 10 years.
Rhode Island			$3,000 a year.
Connecticut	$80,813 80.		
New York	large amounts. $40,000 yearly.	$33,000 yearly.	$106,000 yearly.
Pennsylvania		$200,000.	$12,000.
New Jersey			$11,000.
Maryland	$28,650 yearly.	$32,750, $6,000 annually.	
Virginia	$198,000, $15,060 yearly.	$15,000.	
Alabama	$300,000.		
Indiana	$8,000 yearly.		
Michigan	$100,000, $15,000 yearly.	$168,320.	22,000 acres of land, $9,700 yearly.
Wisconsin	$7,303 76 yearly $27,594.	$30,798 50.	large land grants.
Kansas	$27,594 84.	$30,798 50.	14,400 acres of land, $35,637.
Minnesota	$15,000 for one year.		

Thus far in her history, Illinois, as a state, has done very little for the promotion of this higher form of education. Her citizens have done generously, but as yet no statute graces her records, making a direct appropriation for the promotion of liberal and scientific education. Circumstances have heretofore prevented the founding of a distinct State University, and her liberality has found no channel tempting its exercise. But now the State has a University closely linked to its great industrial interests, and indissolubly bound to its own name and fame. The Industrial University belongs inalienably to the State. The world recognizes it as an institution of the State. Its prosperity will be both a blessing and an honor to the State; its failure would be both a curse and a shame.

With these considerations in view, the Trustees earnestly solicit, and confidently hope for, the favorable action of the Legislature. A failure to make the appropriations asked would be so disastrous that years could not repair the loss. The prompt development of the University will give early to the State the fruits of its work and afford its advantages to hundreds who will otherwise fail to receive them.

J. M. GREGORY,
Chairman of Committee.

AN ACT MAKING APPROPRIATIONS FOR THE BENEFIT AND COMPLETION OF THE ILLINOIS INDUSTRIAL UNIVERSITY.

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly*, That the sum of sixty thousand dollars be and the same is hereby appropriated to the Illinois Industrial University, located at Urbana, Champaign county, Illinois, in amounts and for the purposes hereinafter set forth, viz:

To the agricultural department, including the erection of barns and other out-buildings for the experimental and stock farm, houses for farmer and farm laborers, fencing, drainage, wells, teams, tools, seeds, roads, bridges, fruit and forest trees, and stock of several breeds and varieties, twelve thousand five hundred dollars per annum, for two years.

To the horticultural department, including horticultural buildings and structures, house for gardener, barn and tool house, horticultural implements, fencing, underdrainage, roads, forest and fruit trees, shrubs, plants, etc., ten thousand dollars per annum, for two years.

To the chemical department, the sum of five thousand dollars. To be used for other apparatus and for books, by direction of trustees, ten thousand dollars.

§ 2. The Auditor of Public Accounts is hereby authorized and required to draw his warrant upon the Treasurer of the State of Illinois for the said sums of money, upon orders of the board of trustees of said University, signed by the regent and attested by the secretary of said board, with the seal of said institution affixed thereto. And it shall be the duty of said treasurer, and he is hereby authorized, to pay the same out of moneys in the treasury not otherwise appropriated: *Provided*, that said orders of said trustees shall not be given except as, in their judgment, the necessity arises for the expenditure of the moneys so appropriated for the specific purposes herein provided.

§ 3. This act shall be deemed a public act, and shall be in force from and after its passage.

§ 4. The board of trustees shall not create any indebtedness nor incur any liabilities beyond the provisions of this act.

APPROVED March 27, 1869.

INDEX.

NOTE.—It will be observed that the pages numbers 41–48 are duplicated. In indexing, we have referred to the second series of folios as 41 a, 42 a, etc.

PAGE.

Address of Welcome....122
" to Legislature....55, 58, 59, 363
Agricultural Book-Keeping....235
" Botany....319
" College Scrip sold....56
" Facts and Theories....123
" Lectures and Discussions....44 a, [46 a, 120
Agriculture, Committee on, report of....58, 76
Anatomy, Vegetable....332
Annual Meeting....60
Appendix....363
Apple Culture....132
" Trees, resolution concerning....56
Appropriations....48, 41 a, 363
Auditing Committee, reports of....55, 75, 98

Blackberry Culture....141, 271
Boarding arrangements discontinued....70
Book-Keeping, Agricultural....235
Books purchased....41
Botany, Agricultural....319
Brown, E. L., a Trustee, took his seat....48
Buildings and Grounds, Committee on, reports of....75, 86
Burrill, T. J., appointed an Ass't Professor..41 a
By-laws amended....82

Chemical Laboratory....62
Chemistry and Agriculture....142
Cherry Culture....136
Chicago, action of Common Council of....41a
Circular and Catalogue....1
Coal bill audited....90
Committee:
Auditing Reports....55, 75, 98
Executive....71
doings of....86
minutes of meetings....101
April 28, 1868....101
May 12, " 101
June 11, " 103
Sept. 16, " 105
Jan. 21, 1869....110
April 8, " 112
May 5, " 116
June 2, " 119

PAGE.

Committee:
on Agriculture, reports of....58, 76
Buildings and Grounds, rep'ts of..39, 75, 86
Course of Study, etc., rep'ts of..39, 85, 89
Errors in Accounts, reports of....75, 88
Finance....56, 57, 58, 72, 74, 92
Horticulture....46 a, 80
Library and Cabinets....87
Mechanical Department....54, 83, 86
Nominations....69, 71
Trees of M. L. Dunlap....71, 78, 79
Standing, 1869....70, 71
Corresponding Secretary, compensation of..89
" " elected....79
Corn....138
Currant Culture....141, 272
Cuttings....330

Deficiencies....96
Donations....19, 89
" thanks for....91
Dunlap, M. L., trees of....71, 78, 79

Election of Officers....79
" " votes necessary to....72
Executive Committee:
meetings of....101—119
subjects considered by—
Advertising....118
Agricultural and Horticultural Committees, jurisdiction defined....112
Appropriations....112
Bell....104
Bills audited....101, 103, 106, 108, 110, 113, [116, 117
" Dr. Warder....114
Buildings and Grounds....115, 117
Cabinet of Mr. Hall....114, 118
Catalogues....111, 118
Chairs....109
Chemicals....107, 109
Coal....119
Dining Room....108
Drainage....107, 108
Experimental Orchard....113
Gardener's house....118
Gravel....112

PAGE.

Executive Committee:
subjects considered by—
Laboratory....108, 118
Locating Lands, expenses of....117
Microscope....107
Musical Instrument....104
Propagating House....107
Pump....118
Regent, trip to Europe....115, 117
Roads....115
Roof....119
Salaries Ass't Professors....105
Scrip, sale of....104
State Appropriations....115
Timber....105
Experiments....44 a, 45 a

Faculty....21
" and Course of Study, reports of Committee on....85, 89
" laws and rules for....84, 90
Farm, report on....43
Farms....64
Female Students....54, 75
Finance Committee, reports of....56, 57, 58, 72, [74, 92
Finances....67
Franks, Thomas, appointed Gardener....91
Fruit Culture....129

Galusha, O. B., resolutions of....90
Gazette, vote of thanks to....91
Gooseberry Culture....142, 272
Grape Culture....137
" Vine....289
" Pruning....290
Grass....173, 257
Gregory, Dr. J. M., report of....86, 161
" " resolutions concerning..91
" " vote of confidence in....84

Harding, Col. George, death of....56
Horse, Discussion on the....288
Horticultural Committee, report of....46 a, 80
" Grounds....66

Illinois, Soils of....165
Insurance....52
Investments....55

Kile, Dr. W., took his seat....53

Labor, Student....68, 85, 96
Lands, sale of....70
Library, etc....68
Lots, purchase of....67, 77, 88

Mechanical Department....41 a, 67, 83
Memorial....363
Meteorology....154

Officers and Instructors....21
" election of....78
Orchard Fruits....241

Peach Culture....136
Pear Culture....134
Perham, J., resigned....61, 84

PAGE.

Plant, the....269
Plants, Anatomy, etc., of....221
Plows....167
Plum Culture....136
Polytechnic School....43 a, 44 a
Potatoes....213
Powell, Prof., resigned....63
" " settlement with....71
Press, thanks to....92
Propagation....264, 269
" by cuttings....269

Quince Culture....137

Raspberry Culture....141, 270
Receipts and Expenses of University....59
Regent, Annual Report of....61
" report of....56
Regulations of the University....90
Root Crops....228

Salaries of Professors, payable monthly....59
Sale of lands....70
Scholarships....69
Scrip, sale of....56, 58, 70
Shattuck, Col. S. W., elected Ass't Prof....41 a
Sheep....303
Small Fruits....128, 268
Snyder, E., elected Ass't Professor....41 a
Soils, Management of....167
" of Illinois....165
Strawberry Culture....128, 268
Stuart, A. P. S., appointed Professor....41 a
Students....22
Studies....88
Study, Courses of:
Agricultural....35
General....37
Harvard University....38
Massachusetts Agricultural College....39
" Institute of Technology..39
Michigan Agricultural College....38
Rensselaer Polytechnic Institute....38
Sheffield Scientific School....34
Superintendent of Farm, report of....43
Swine....298

Taxes on lands located....53
Timber growing....332
Treasurer, elected....79
" salary of....90
" reports of....54, 58, 69
Trustees, Board of....20
" meeting, Nov. 18 1868....35
" " March 12, 1869....60
" reduction of numbers....77
" sworn in....63
Tuition....77, 96

University:
Aims of....1
Building....1, 67
Departments of Study....4
Regulations....90
Uniform....14

Warrants drawn, list of....94
Wheat....293

APPENDIX TO REPORT VOLUME.

PROCEEDINGS AND DEBATES

OF THE

AMERICAN

Convention of Cattle Commissioners,

HELD AT

SPRINGFIELD, ILLINOIS, DECEMBER 1st, 2nd and 3d, 1868.

PROCEEDINGS.

SPRINGFIELD, ILLINOIS,
Wednesday, Dec. 1, 1868.

The American Convention of Cattle Commissioners assembled in convention at Representatives' Hall, Springfield, Illinois, at 12 o'clock, M., in pursuance of the following call:

STATE OF ILLINOIS, EXECUTIVE DEPARTMENT,
Springfield, October 26, 1868.

The commissioners appointed by the several States to consider the history, nature and character of the disease among cattle known as Texas fever, and to collect and publish to the country all information possible, bearing upon the subject; to prepare a draft of a law which shall be uniform in all the States interested in the raising, sale or purchase of cattle, and which will regulate the trade upon a safe and equal basis, and secure the most perfect protection to all parties—have agreed to hold a convention in the city of Springfield, Illinois, on Tuesday, December 1st, 1868, to accomplish these desirable ends.

Responding to this laudable movement, and believing I shall reflect the wishes of our people upon a matter of such vast importance to all, I have appointed, on the part of the State of Illinois, as commissioners, to meet and consult with those from other States, the following gentlemen: Hon. James N. Brown and Dr. H. C. Johns, heretofore appointed by the State Agricultural Society, H. N. Edwards and E. H. Piper, special commissioners of this State, and Hon. John P. Reynolds.

The commissioners of all the States and of the Dominion of Canada are respectfully invited to meet in the hall of the House of Representatives, Springfield, Illinois, on Tuesday, December 1, 1868, at 12 M., when it is hoped such action may be had as shall allay the public anxiety arising from this disease, and secure satisfactory safeguards against its further inroads upon the cattle interests.

RICHARD J. OGLESBY,
Governor of Illinois.

Dr. Johns, of Illinois—Gentlemen, will you please come to order. I nominate Joseph Poole, Esq., of Indiana, temporary chairman of this convention.

The motion prevailed.

The Chairman—Gentlemen and commissioners of the convention, the honor conferred upon me by this unexpected appointment is accepted with diffidence, and a perfect knowledge of my inability to fill so important and responsible a position. Permit me, gentlemen of the convention, to thank you for the honor thus conferred, and to ask your kind indulgence and forbearance towards me in the discharge of my duties.

Dr. Johns, of Illinois—Mr. Chairman, I move that Mr. H. D. Emery, of Chicago, be the temporary secretary.

The motion prevailed.

Dr. Morse, of Missouri—I move, Mr. Chairman, that a committee on credentials, consisting of three members, be appointed by the chair.

The Chairman—I should prefer that the appointing power be left with the convention. Will the gentleman accept of that suggestion as an amendment to his motion.

Dr. Morse—Certainly sir.

The motion prevailed, and the following gentlemen were appointed by the convention to serve on this committee: Dr. Morse, of Missouri; Mr. Howard, of M chigan; Dr. Johns, of Illinois.

Mr. Christie, of Canada—I move, Mr. Chairman, that a committee of ten be appointed by the convention as a committee on permanent organization.

The motion prevailed, and the following gentlemen were, on nomination, designated to serve: Mr. Christie, of Canada, chairman; Prof. Smith, of Missouri; Mr. Messenger, of Ohio; Mr. Allen, of New York; Mr. Carter, of Maryland; Mr. Earl, of Indiana; Dr. Miles, of Michigan; Dr. Snow, of Rhode Island; Dr. Thayer, of Massachusetts; Mr. Reynolds, of Illinois.

Dr. Johns, of Illinois—I move, Mr. Chairman, that this convention do now adjourn, to meet again at half-past two this afternoon, by which time the committees on credentials and permanent organization will probably be ready to report.

The motion prevailed.

AFTERNOON SESSION.

THE CHAIRMAN—The convention will please come to order. Gentlemen, the first thing to be presented to us is the report of the committee on credentials. Is the committee ready to report?

DR. MORSE, of Missouri, chairman of the committee on credentials—Mr. Chairman, I beg leave to submit the following report:

We, the undersigned, committee on credentials, respectfully report that we find the Province of Ontario duly represented by the following named commissioners: Hon. D. Christie, A. A. Burnham, F. W. Stone.

The States, so far as represented, by the following:

Illinois.—John P. Reynolds, Dr. Wm. Kile, H. N. Edwards, E. A. Piper, Dr. H. C. Johns.

Indiana.—Joseph Poole, James Matthews, A. Earle.

Maryland.—Dr. Nathaniel Brown, Dr. Richard Mackall, Dr. W. S. McPherson, John M. Carter.

Massachusetts.—Dr. Elisha F. Thayer.

Michigan.—Dr. M. Mills, Sanford Howard.

Missouri.—Dr. L. D. Morse, Prof. Spencer Smith, H. J. Moore.

New York.—Marsena S. Patrick, Lewis F. Allen, John Stanton Gould.

Ohio.—James Stockdale, Dr. Wm. Clendennin, D. McMillan, Thomas Reber, E. Messenger.

Rhode Island.—Dr. E. M. Snow.

Wisconsin.—Prof. P. A. Chadbourne, B. R. Hinckley.

We also recommend the following named gentlemen to seats in the convention, as honorary members: Arthur B. Barrett, Jefferson K. Clark, G. O. Kalb, delegates of the St. Louis Agricultural and Mechanical Association. Also, Dr. M. Morris, of New York; Dr. John H. Rauch, of Chicago; H. D. Emery, of Chicago; Joseph A. McCoy, of Abilene, Kansas.

The report was received and adopted.

THE CHAIRMAN—Gentlemen, the next thing in order is the report of the committee on permanent organization. Is that committee ready to report?

MR. CHRISTIE, of Canada, chairman of committee on permanent organization—Mr. Chairman, the committee beg leave to submit the following report:

That Hon. Lewis F. Allen, of Buffalo, be the president of the convention.

That Hon. D. Christie, Thomas Reber, Dr. Richard Mackall, General M. S. Patrick, P. A. Chadbourne, E. F. Thayer, Sanford Howard, Capt. H. J. Moore, Dr. H. C. Johns, Joseph Poole, Dr. N. S. Townsend, A. B. Hamilton, and Dr. Snow, be vice-presidents of the convention.

That J. P. Reynolds, of Illinois; Dr. L. D. Morse, of Missouri; and Dr. Moreau Morris, of New York, be the secretaries of the convention.

That Messrs. Ely, Burnham & Bartlett be the official stenographic reporters to the convention.

All of which is respectfully submitted.

DANIEL CHRISTIE, *Chairman.*

The report was received and unanimously adopted.

Mr. Reynolds, of Illinois—Mr. Chairman, I move that a committee of three be appointed by the chair to escort the president of the convention to his seat.

The motion prevailed.

The Chairman—I appoint Mr. McMillan, of Ohio, Mr. Johns, of Illinois, and Mr. Earl, of Indiana, to perform that duty.

The gentlemen named conducted Mr. Allen to the chair.

The Chairman—Gentlemen, permit me to introduce to you the president of this convention, Hon. L. F. Allen.

The President—Gentlemen of the convention, I feel highly gratified and as highly honored at being selected by so respectable and dignified a body of gentlemen as I see before me, to be their presiding officer on this occasion. You will kindly excuse my inexperience, the want of tact I may exhibit, and the many lapses of duty that may occur during such time as I may fill the chair. I only say that I will serve you according to my best abilities.

As many conflicting interests may, perhaps, arise, and considerable discussion may ensue, I beg leave to suggest that our time is precious, and that remarks should be made as short and comprehensive as possible. I will, myself, set the example, by saying no more, but simply ask you to proceed to the consideration of the subject which has brought us together.

Dr. Miles, of Michigan—Mr. President, as it seems desirable that there should be some name for this convention, I therefore move that it be called the American Convention of Cattle Commissioners.

The motion prevailed.

Mr. Poole, of Indiana—Mr. President: I move that the gentleman from New York, Mr. Gould, address the convention, as he has devoted a great deal of consideration to the subject in which we are all so much interested.

The motion prevailed.

Dr. JOHNS, of Illinois—Mr. President: I move that his excellency, the Governor of Illinois, be invited to a seat beside the president. The motion prevailed, and his excellency accepted a seat by the side of the president.

Mr. GOULD, of New York—Mr. President and gentlemen of the convention: At the suggestion of the cattle commissioners, delegated by his excellency, the governor of the state of Illinois, the New York commissioners issued a circular, under the direction of the governor of that state, calling a convention of the different states and the province of Ontario, of Canada, to meet in Springfield, at the present time. The circumstances of issuing this call were briefly these: It was found that an alarming and wide-spread plague was devastating the western regions of our country. The proper remedies were not understood; the modes of prevention were not at all comprehended, and it was evident that our flocks and herds would be swept away unless prompt measures were taken.

We, in the state of New York, have one million two hundred and fifty thousand cattle; their value is immense, for it is not merely a value which is represented by their value for food, but we have a vast number of animals worth from three to five thousand dollars for breeding purposes. In addition to this, sir, our flocks and herds are mainly devoted to the production of milk and its compounds. The milk sold and the value of the cheese and butter manufactured in the state of New York, amount, annually, to twenty-five millions of dollars.

I will not attempt, sir, to state the statistics of the great west, for gentlemen who are now present, know far better than I what great interests they have at stake in the preservation and propagation of the cattle which surround us on every hand.

It seemed to us, therefore, that every exertion should be used to learn all that could possibly be learned in relation to this disease—its character, its prevention and its remedies. We learned the value of the old American maxim, that in "union there is strength." Each of us knew something, and we thought that by bringing together our varied contributions, we might, in the aggregate, arrive at a degree of wisdom in relation to these matters, which, acting as isolated individuals or isolated states, it would be entirely impossible for us to reach. Therefore it was that this convention was called together—that was one object. Another

matter which interested us, and which developed itself during our investigations regarding this cattle disease, was the condition in which animals are brought to New York; and we believe that the results of those investigations are of the greatest importance to the west as well as to the east.

We found, without any kind of controversy whatever, that cattle were losing from seventy to one hundred pounds in their transportation from Illinois to the state of New York. We found, too, in testimony of the most experienced drovers, that this was entirely unnecessary; that it was a waste of cattle flesh that was exceedingly injurious to the producers here upon the prairies, and equally injurious to us of the east, who need every pound of meat that can be brought to our markets.

It was suggested that laws were absolutely necessary to protect us from the invasion of the plague, and also necessary to protect us against that feverish condition in which our meats reached us, and against the great loss in the weight of cattle which arose from the rapid and cruel transportation of animals, for such enormous distances, without food or drink.

We knew, sir, that it was utterly impossible for any one single state to act alone, where interests were so various. The interests of the farmer, of the drover, of the butcher and consumer, of the small and of the large transporters and producers, and in short, the interests of whole communities, seemed, at first glance, to be so antagonistic, that we felt that unless all of the states concerned were induced to join in one common system of legislation, the mighty evils to which we have alluded, would continue to affect us. We supposed that nothing could be easier than for a convention of intelligent and trustworthy gentlemen, from each of the states represented on this floor, to agree among themselves as to the best modes of remedying these difficulties—remedying them in such a way as to protect us against the ravages of disease, and at the same time prevent the most perfect freedom of commerce, which was compatible with the safety of our flocks and herds. We supposed, also, that we might easily, after suitable conference, agree upon the terms of a series of propositions which might be submitted to the legislatures of the several states, and be by them put into legal phraseology; that these enactments might be adapted to the various circumstances of the states interested, at the same time securing a substantial commerce in the means to

be adopted and the remedies to be applied, in order that one state might work into the hands of another and thus prevent all dissatisfaction.

In order, sir, to accomplish this object, I will, at a proper time, move the appointment of a committee to consider the terms of such a law as I have described—such a law as can be submitted to the various state legislatures, and upon the terms of which we can also agree—and by which, also, some legislative measures may be adopted whereby cattle may be conveyed from Illinois and other western states to New York and other eastern states, without that terrible loss of valuable food which is an inevitable incident of the present methods of transportation.

It seems to me, sir, that such a committee, judiciously appointed, may easily bring before us a series of propositions, which, when discussed, and united in, will be adopted, without hesitation, by the legislatures of the different states, and which will be productive of incalculable benefit to the country at large.

I might stop here, sir, but having been requested by many delegates on this floor, who are deeply interested in this cattle disease, to state what we have ascertained in relation to it in New York, I propose to spend a few moments in complying with their wish. I do this for the two-fold purpose of, in the first place, enlightening those who may be ignorant in relation to this matter, and in the second place, of showing gentlemen where the information which we have obtained can be readily and judiciously supplemented by the knowledge acquired by members from the west and from Canada, who will thus see at once, as I proceed, the exact points where they can the more enlighten this assembly, and whereby we can have a full understanding of the matter in all its bearings.

I will, therefore, sir, with your permission, state what I have ascertained to be the external symptoms of the disease—those symptoms which are patent to all. It is very probable that many other symptoms have been observed than those which I shall relate, and if gentlemen who follow me will supplement the omissions which I make, we shall be enabled, before we are through, to have a complete description of the disease, in all its various aspects throughout the country.

With regard to the external and obvious symptoms. The first thing which we observe is, that the animal drops its head below

the level of the back; next, (and this is one of the most important points) that there is a peculiar expression of the eye, which I, at least, have never noticed in any other form of disease whatever, and which I call a stupid stare. Gentlemen who are accustomed to cattle, know very well that there is a staring eye, which is associated with wildness, when the animal is terrified, but this to which I refer differs entirely from that. The next point is roughness of the coat, though this symptom has not always been found in our experience, for some of the sickest animals that I have ever seen have had smooth coats. But generally speaking, this rough coat is one of the characteristics of the disease.

The next noticeable point is the appearance of the urine, which is almost black. A person without any particular experience, regarding this symptom, would say it contained blood, but on microscopical examination it is found not to be blood, but only the coloring matter of the blood. This is, also, however, a rather uncertain symptom. It is true we do find it in a great majority of cases, but in others, and among the sickest animals I have seen, the urine has been perfectly clear and limpid.

The next symptoms are the staggering gait and weakness of the limbs. It seems as though the animals had been attacked with paralysis of the muscles of the extremities, so that when they attempt to go forward they tremble and present an appearance as if walking over glare ice. These symptoms are almost unmistakable, as they have never been met with to the same extent, and presented in the same manner, in any other previous disease.

Again, the spine, in most cases, is arched. Ineffectual efforts are made to dung. This symptom is not always present, but in almost every case this arched back is one of the most positive external characteristics of the disease.

Then comes drooling from the corners of the lips. We often see that, to be sure, in healthy cattle, but the peculiarity of the drooling which characterizes this disease is that the drooled matter is filled with air bubbles, and may be described as a "frothy" drool. Sometimes blood is seen in the stools, but this is very rare, and it can hardly be considered a characteristic of the disease.

Sometimes the bowels are constipated and sometimes very loose, so there is no certain rule as regards that. In every case, however, the bowels are in an unnatural condition.

We sometimes see mucus discharged from the nose, but this, in our experience in New York, is rather an uncommon indication.

A still less common symptom is a yellowish rheum issuing from the eyes. I have seen that occasionally, but it has happened very rarely in our experience.

Now, gentlemen, when we find these symptoms or any other of them present, we introduce into the rectum or dung, as butchers call it, a thermometer prepared especially for that purpose, a sample of which I have now before me. The animal is held by the nose in a manner well known to us all, and the thermometer, which, by-the-way, is a self-registering one, is introduced into the rectum, and held there for two or three minutes. Whenever we find the temperature over 103 degrees, two or three of the symptoms above named being also present, you may be absolutely sure that you have a case of genuine Texas cattle fever. This furnishes the crucial test, which has never yet failed in a single instance. Let me give an illustration of the value of this instrument, in determining the presence or absence of the cattle disease. A large number of cattle passed through Amenia, Dutchess county, New York, which were very seriously diseased, and which were arrested by our assistant cattle commissioner there, as being infected with the Texas fever, but on the introduction of a thermometer, the temperature was found not to exceed 101 degrees, which sufficiently showed an error in diagnosis. On examination, it was found that those animals had sickened, not with Texas fever, but with pleuro pneumonia, and, on being treated for that, recovered.

Now, right here, I wish to impress upon the cattle owners of this great western country, the necessity of using this instrument. By so doing, they will save themselves a great deal of anxiety; it would clear away every uncertainty, and point out unmistakably the proper course to be pursued, for the moment that the thermometer rises above 103, in connection with the symptoms I have spoken of, there can be no doubt of the presence of the Texas fever. If it rises to 107 degrees, that animal must die; it is a sure sentence of death; we may as well cut the throats of those cattle at once, for there is no possibility of their recovery. Between 102 and 105 degrees, it is possible that rest, food and suitable medication may restore them to some degree of health, but, after

all, the sooner the animal is destroyed the better, after this instrument indicates the temperature of which I have spoken.

Again, the pulse is very rapid. Generally speaking, it will be found to be 120 strokes in a minute, while in a healthy animal it rarely rises above fifty-eight or sixty, so that when you find this great acceleration of the pulse, you may be sure that the case is one of exceeding gravity.

Finally, if the nose is held over the animal, particularly in the region of the flank, you will detect a peculiar odor, which, once being smelled, can never be forgotten. It is very hard to describe this scent, but I will approximate as near as I am able, perhaps, by saying that it is a decomposed gamey odor—something like that of game which has been kept a little too long.

These complete, as far as we have observed, the external symptoms which indicate the presence of the cattle disease.

I now pass onward to the description of the internal characteristics of the disease, as disclosed upon post mortem examination. The first thing that strikes the eye, upon opening the animal, is the greenish-yellow, and sometimes brownish, appearance of the fat; the lean parts, particularly the muscles between the ribs, are of a dark-brown mahogany color. I think I may venture to say that whenever you find these peculiar appearances of the fat and the lean, the animal has died with the Texas fever.

The liver is almost invariably found to be enlarged, and when cutting into it, the knife blade has a peculiar fatty appearance, as of having cut lard. On examining this enlarged liver, through the microscope, certain small spots will be found, surrounded by an octagonal boundary, with minute lines radiating from these octagonal boundaries to the center, and, on examining carefully, you will see in the center of this octagon, a round yellow spot, which, on a still further microscopical examination, is found to consist of bile. These spots are crowded closely together. This is an irresistible evidence of the disease; and, examining through the microscope, we can make no mistake regarding the cause of the animal's death.

We come now to the spleen, where the ecchymosis is always found. The color of the spleen, in a healthy animal, as you all well know, is a beautiful, pearly gray; but, when the animal is diseased, it assumes the appearance of castile soap—white and dark, mottled—the dark parts being of a deeper color than is

usually found in the soap. On cutting into the spleen, it is found to be exceedingly dark and black, and almost always there is a thick fluid exuding therefrom. Those of you accustomed to looking at healthy spleens, or melts, I believe they are sometimes called, will have no difficulty in recognizing, in the anterior portion of this organ, a departure from its healthy condition. The enlargement of this organ is sometimes enormous. While on my way to this convention, I found at Buffalo two Texas steers, in the last stages of the disease. On examining the spleens, they were found, by actual measurement, to be two feet five inches long, with an average breadth of five inches and three quarters, and measuring through the center three and one quarter inches. This enlargement of the spleen is an inevitable concomitant of the disease, and this, as I have said in regard to the liver, indicates it unmistakably.

The kidneys do not present so great regularity of appearance. Sometimes they present a tolerably healthy appearance, while at other times they are found, when cut into, to be filled with a dark, bloody matter, generally somewhat darker than is natural. Still, this is not very common.

The third and fourth stomachs are more or less inflamed, and it may be proper to enter rather more fully into the description of their appearance. The manifolds generally contain, as is found on turning over the leaves, half digested food, in a very hard condition. In the Texas steer, which we dissected at Buffalo, we found that every leaf was covered with small, round and very hard substances, having the appearance of gun wads--the outer leaves containing larger ones than the inner—the gun wads gradually diminishing in size from the outward to the inner. These substances adhered so tenaciously that whenever they were pulled away the lining membrane was also torn away from the stomach with them. This may not always occur, but usually the digested food in the manifolds of a healthy animal is much softer and of less consistency than it is found to be in an animal diseased with the Texas fever, when it is always harsh, hard and dry.

We come now to the last stomach—the obomassum or rennet. The upper part of that stomach consists of folds, arranged as a lady's scarf is folded. Generally speaking, a considerable portion of that is found to be a very dark red, and in the tops of the folds there are sulcations which, in most cases, are filled with a sort of clotted blood.

Descending to the lower part, near where the stomach communicates with the smaller entrails, we find four or five inches of that, presenting the appearance of Russia leather, having large papillæ ascending from the surface, the color of which, in the natural state, is about as near the external color of this capitol as any thing I can think of, and which has no appearance of ulceration whatever. But, in diseased animals, you will invariably find deep ulcerations in this portion of the rennet, and nothing is more characteristic of the disease than these same ulcerations. In the Texas animal examined at Buffalo, we found a large ragged ulcer, two inches long and an inch broad, the ends of which had been drawn inward in such a way as to raise up the surface, and cause the ulcer to be fully half an inch deep. This is the largest one that I have ever seen, but they will be found in almost every period of the disease, scattered over portions of the stomach.

The rectum is generally inflamed, and that in longitudinal lines, about an inch apart, through the whole of it. The lower part is generally completely engorged with blood, in a very high state of congestion.

These are, then, the internal indications of the Spanish fever.

Coming to the blood, we find that it is generally lighter than usual, and, under the microscope, many of the blood discs are found to be not perfectly round, but presenting an appearance as though saw teeth had been cut into the edges, one half appearing to be cut off. In other words, we have seen them like the new moon, the serrations being in the anterior of the curve. These peculiarities of the blood discs are very marked under the microscope.

Speaking chemically in relation to the blood, the Spanish cattle disease may be described as one which destroys the blood corpuscles, substituting water for blood. My memory for numbers is not very good, but my impression is that our New York chemists have found the blood of animals suffering under this disease to contain eight hundred and seventy parts of water to one hundred and thirty of blood, taking one thousand as the basis. This is one of the most striking features of the disease.

The bile is generally thickened. As expressed from the gall bladder of a healthy animal, it is very fluid and limpid, but in a diseased animal it has a tarry appearance, flowing in flakes.

I come now to a point which has been observed with a great

deal of care and minuteness by the board of health of the city of New York, headed by Dr. Harris, and by the board of health of Chicago, headed by our honorable member Dr. Rauch. A minute point has first been observed in the blood, which, after a time, enlarges, and presents an ear or kidney-like shape. It then still further enlarges, continuing, however, of the same general form, but having two nuclei. My friend, Dr. Morris, the assistant commissioner from New York, will give you further information on this point, and I simply alluded to it, in order to lay the foundation for certain general ideas which I wish to impress upon the minds of this convention. This minute spore, when transplanted from the subject to an apple, the rind of a lemon, or any other similar object, and kept at a temperature of ninety-eight degrees, grows and developes very peculiarly; and in regard to this, also, my friend, the Doctor, will have something to say. The growth of these spores has enabled the scientific men of our commission to determine with accuracy this—that they belonged to the ordian family —which is the same as that to which mildew found on the grape leaf belongs. The genera, and species, may be said to be the tilletia caries.

The heart and lungs generally present a healthy appearance, though there are some exceptions to this rule. So far as our experience has gone, the lungs, especially, are generally in a sound condition.

The brain is occasionally softened. In the bullock examined at Buffalo, to which I have already alluded, the brain, from the surface to the corpus callosum, was so softened that it could be scraped out with the finger, as one would scrape out batter. The surface of the brain is injected with venous blood, and presents also a very marked appearance.

Another very remarkable discovery made by post mortem examinations, and one very well worthy your consideration, is this: that on handling the viscera of an animal that has died from the Texas fever, the hands are affected with a smarting sensation very similar to that produced by dabbling in mustard water. I know of no other instance in which the handling the remains of a diseased animal is attended with this peculiar sensation.

I have now given you an exact description of the external and internal manifestations of Texas fever, so far as we have observed them in New York.

I understand there has been some question at the west as to whether Texas cattle ever do have this disease, and we have been told, again and again, that they do not. I need not repeat the remarks that I have already made, but I would like to say that during the past week I have seen two Texas cattle as sick with it as any animals I ever saw. We have the testimony of Prof. Gamgee, who saw six Texas cattle laboring under this fever. Ninety-four Texas cattle were slaughtered in New York, early in September, which presented unmistakable evidences of the disease. We, ourselves, while on our way hither, stopped at LaFayette, Indiana, where we saw one hundred and forty-two Texas cattle slaughtered, and we found that, although they were in a healthy condition at that time, there were unmistakable marks of the disease. You, yourselves, this morning, at the slaughter house, saw the unmistakable evidences of disease presented by the animal there killed; and on comparison of that animal with the native animal killed immediately afterwards, you could not but have seen the difference between them. I therefore need not dwell, as otherwise I should feel it my duty to do, upon this topic, after all this proof which shows so conclusively that Texas cattle can have this disease.

You may ask me why it is that so many individuals, familiar with Texas cattle, should take the stand which many of them do in regard to this disease. My answer to this would be very simple. You know that Indians are said to be hardier than we are. Bring an Indian here and he will run farther than any of us, hold a weight much longer, and be less liable to very many diseases. I say that the reason of all this is that the Indians are so exposed, and undergo so many hardships during infancy, that those who have any weak spots soon die. So it is with the Texas cattle; they get no consideration; the calf is obliged to fight the battle of life for itself, and if too weak to do that must die at an early age. Therefore it is that these cattle, being so strong and hardy a set of animals, are better able to contend with the disease than our more delicate breeds. But, that they do succumb to this scourge, in numerous instances, cannot be doubted.

It has been alleged, and generally believed by most gentlemen here, that native cattle cannot communicate the disease to native cattle. We in New York know that this can be done, and as this is a matter of particular importance, and one in regard to which no observation has been particularly made at the west, I will, with

your permission, read a carefully prepared statement of certain circumstances which occurred in Orange county, New York, which I will myself verify, for they all occurred under my own immediate observation.

On the 25th day of August, 1868, a lot of forty-four cattle arrived in Goshen, at about six o'clock in the morning, which had been purchased in Buffalo, by Charles H. Church, for John Hodge, of Goshen. Mr. W. Church, the father of Charles, alleges that the whole lot was purchased of a man named Gridley, who lives about ten miles from Painesville, Ohio. Mr. Hodge, the owner of the cattle, says, on the other hand, that sixteen of them were picked up at Buffalo—their place of origin being unknown. He admits, however, that twenty-eight of them were purchased near Painesville, and had been owned by the farmers of whom they were purchased over a year. There was one steer in the lot; all the rest were cows or heifers. It is certain that there were no Texas or Cherokee cattle among them. On their arrival, there was no symptom of disease observed among them. The cow that subsequently died was carefully examined by three different buyers, within two hours after her arrival. They were experienced men, and each of them made offers for her, but the price was not such as Mr. Hodge thought she ought to be sold for. He has been in the cattle trade for over thirty years, and is thoroughly acquainted with the usual signs of a healthy condition in cattle.

It is clear that if Mr. Hodge had suspected that the cow had been diseased, he would have sold her at the price offered; and if the buyers had suspected disease, they would not have made the offers that they did, which were seventy, seventy-two and seventy-five dollars, respectively.

At ten o'clock, A. M., Mr. Hodge discovered, for the first time, that the cow appeared weak in the knees, and staggered slightly when she walked. By eleven o'clock, A. M., these symptoms were aggravated, and Mr. Hodge drove her into a small lot by herself. This lot was bounded on one side by a low stone wall, standing on the edge of a steep hill, the foot of which adjoined the public road. Mr. Hodge being busily engaged in selling the remainder of the cattle, he paid no attention to her until four o'clock, P. M., when word was brought to him that the cow was lying in the road. On going to her, he found that the wall had fallen down, and the marks on the side-hill showed that she had

slidden down it into the road. He infers that she fell down suddenly, throwing down the wall. He then put her into a stone-boat and had her drawn to a small orchard, by a pair of oxen. She lay there until about six o'clock, P. M., when she died. She was a grade Devon, and was within about four weeks of calving, and had been on the cars thirty-seven hours, without food, drink, or rest. She was buried about two feet deep, but swelled so much after death that she could be plainly seen. No symptoms of disease, other than those already mentioned, were discovered previous to her death.

On Saturday, the 29th of August, William Morel, of Montgomery, Orange county, N. Y., purchased two cows out of this lot of Mr. Hodges, reserving the right to return them if he did not like them on trial. The purchase was made late in the afternoon, and he therefore left them that night at the farm of his brother, John Morel, of Hamptonsburgh, who turned them into the pasture with his own cows. *These were the only strange cows that they ever had been in contact with.*

On Tuesday, September 1, William Morel removed the two cows to his own farm. After keeping them some days (the precise number does not exactly appear,) he returned one of them to Mr. Hodge, saying he did not like her as well as he expected to, but not alleging any sickness as the cause of the return. Mr. Hodge then resold her to another person, who also was dissatisfied with her, and returned her; but did not allege ill health as the cause of his dissatisfaction.

The cow that Wm. Morel retained died on Tuesday, the 8th of September. Her milk began to diminish two days before. On the day of her death she appeared weak in the knees, and staggered in her walk. After her death bloody matter was found upon the ground. This is all the information we have been able to obtain respecting the death of the second cow.

The cow which William Morel returned died on the 11th of September. Nothing unusual was observed about her. The first knowledge that Mr. Hodge (who then owned her) had of her being diseased, was when he found her dead in the lot. This was the third cow, of the original importation by Mr. Hodge, that died, and we cannot find that any others have died up to this time, November 1st

On the 12th of September, one of John Morel's cows, which had been in the pasture with the two cows which William Morel brought there on the 29th of August, was taken sick. She had been drooping for some days before, and had fallen off in her milk. On the morning of the 13th her milk was entirely gone. Her head hung down below the line of her back. She was weak and staggered very much when she attempted to walk. She lay down and got up frequently, and was restless and uneasy. Sometime before her death she was in great distress. She was very thirsty, and ate hay with an apparent relish, within a short time of her death. She died about two o'clock, P. M., on the 13th.

On the 14th of September, another, and the second of John Morel's cows, was taken sick, which somewhat alarmed him, and he paid more particular attention to the symptoms than he had done before. She had the hoof ail about two weeks before, but had recovered from it. On the night of the 13th she gave a larger mess of milk than she had done since she had the hoof ail. On the morning of the 15th, her coat was rough; all the hairs seemed to stand upright. Her head hung down and her ears were flabby and drooping. Her milk was entirely suppressed, her urine was nearly black, her bowels were loose and the stools were very offensive and almost putrid. She staggered in her gait, lay down and got up often, was very thirsty, and died towards evening, on the 15th of September.

On the morning of the 18th, John Morel found his third cow dead in the lot. She was observed for four days previously to be falling off in her milk, and to be somewhat drooping. On the evening of the 17th he gave her some medicine, and the next morning found her dead, as above stated.

On the 21st an ox died at Hamptonsburgh, which belonged to Mr. Hodge, and which had been employed in hauling away the carcasses of the first and third cows that died of the original importation. He had also got into the orchard in which the first cow died, and remained in it all night. All that could be learned of his symptoms was, that after death his rectum was protruded, and was very red.

Another ox, that had been employed in hauling away dead animals, was taken sick, and remained ill for two days. He then began to recover, and in about ten days he was deemed fit for work by the owner, but has not been used since.

These seven deaths seemed to excite no alarm among the inhabitants. The weather was exceedingly hot, and most of the deaths were popularly attributed to milk fever.

John Morrel had the second cow opened, and he says the lungs were out of order. The ox was supposed to have died in consequence of being choked by an apple from the orchard where he was pastured.

These facts, or rather the rumor of them, reached the commissioners about the first of October, when D. Montfort, of Newburgh, was appointed an assistant commissioner for the county of Orange. He visited the localities which had been the seat of the disease, but found no evidence sufficient to show that it was the Texas fever.

Later rumors began to circulate that it was the Texas fever; whereupon, Mr. Gould, the commissioner residing in the eastern district, accompanied by assistant commissioners Morris and Montfort, went to the localities, and by carefully questioning all the parties, there appeared to be the strongest probability that these cattle had all died of the true Texas fever. As no cattle had died or been sick for four weeks previously, it was confidently believed that the disease had spent its force, and that no more danger was to be apprehended. The parties were, however, strictly enjoined to give the earliest possible notice to Dr. Montfort, should any further appearance of the disease be manifested.

On Saturday, the 24th of October, John M. Morrel, of Hamptonsburgh, residing on what is locally known as the "Purgatory Farm," found two of his heifers dead in the pasture lot. They had been running for some time on Mr. Church's pasture, in which the third cow of the original importation, and the ox that died, had run. On Sunday, the 18th of October, Mr. Morrel brought them to a small pasture, where he observed them closely until Tuesday, the 20th, when he turned them on to a lot on his own farm. From this lot, they had ready access to Mr. Church's lot, and to which they went almost immediately, and remained there. The last time that Mr. Morrel saw them was on Friday, the 23d, when they were feeding on the hill-side apparently well. He found them dead between one and two o'clock on Saturday. Dr. Montfort was immediately notified, and accompanied by Dr. Morris, assistant commissioner for New York, who had great experience in the disease, and who carefully examined these—

they pronounced the post mortem appearance precisely those of the Texas fever.

Dr. Morris carried specimens of the blood, bile and tissues of the diseased animals to New York, where Dr. Stiles gave them a careful microscopic examination, but failed to find the characteristic cryptogam in the blood or bile, or yellow circle in the center of the lobules of the liver. After the examination, the bodies were carefully burned, under the direction of the assistant commissioner.

On the morning of the 26th, Mr. Gould arrived in Goshen, and remained there until noon of the following day. He visited all the localities where disease had manifested itself, and quarantined the cattle that had been exposed to the diseased animals. He also published a set of plain directions to farmers to aid them in preventing the spread of the disease, and to treat it when it appeared, which was published in the county papers.

The next case occurred on the farm of John Morrel, at Hamptonsburgh, on Monday, the 26th of October. Mr. Morrel says that at first he would have hardly noticed anything wrong if his fears had not been excited by previous deaths in his herd. As the day wore on the symptoms were aggravated; the back was arched, and ineffectual efforts were made to evacuate the rectum. She was very restless; walking a few steps and then stopping. At night she gave a fair quantity of milk. On Tuesday morning she was in an apparently dying condition, and at half past seven o'clock in the morning she was dead.

At half past three o'clock, Dr. Montfort arrived at the farm and made a post mortem examination, of which he makes the following report—

"Flesh very dark; fat of a reddish-yellow color; lungs perfectly healthy; heart healthy; spleen enlarged to three times its natural size and filled with blood; liver slightly enlarged and fatty; kidneys healthy; fourth stomach at pyloric extremity reddened and inflamed with ulcers; mucous membrane peeling off readily; bladder entirely empty and contracted—feeling almost like a ball; rectum very much inflamed; mucous membrane softened."

The animal having been confined in a stable, Dr. Montfort ordered it to be thoroughly disinfected with the Henny carbolic oil, and all cattle to be excluded. The remainder of the herd were confined to one pasture.

This completes the history, and I think you will agree with me that it shows most satisfactorily that the genuine Texas fever may be transmitted from one native animal to another. It is true that this is an unfrequent occurrence, but having happened once, it may occur again under special conditions calculated to promote it, and we ought, therefore, to keep that possibility clearly in our minds while determining the draft of the legislative provisions intended to prevent its spread.

I come, now, to this question. What is the real essence of this disease? Why is it that a certain plant causes the destruction of the animal? Now, gentlemen, hitherto I have been on impregnable ground. It is possible, that regarding what I am about to state, there may be differences of opinion.

You are all aware, gentlemen, that the term mycelia, when speaking of cryptogamous plants, has the same meaning as the word roots, when applied to other species of plants. When we speak of mycelia, we speak of roots. In examining these objects under the microscope, we have never yet seen any mycelia; but I have no doubt, and I think none of us can doubt, but that mycelia exists in these, for the reason that all other cryptogamous plants do have mycelia.

Again, in examining blood discs at various times, Dr. Stiles has found they were perforated with minute holes, as though they had been worm-eaten, and that, when thus worm-eaten, they always diminish in bulk and size. As Dr. Morris will show you, when exhibiting the microscopic appearances, these objects appear like minute dust, like the prick of a pin. You will see that, as this microscope magnifies five-hundred times, it follows that these must be the size of the five-hundredth part of the prick of a pin. As I said before, these minute drops, after a little time, enlarge and present an ear-shaped appearance; after which, enlarging still further, two nuclei are discovered. Now, gentlemen, it is perfectly obvious that nothing can gain in bulk by the creation of its own matter, and if a growing body does increase in size, it is perfectly plain, and beyond the shadow of a doubt, that this increase must be gained from some source exterior to itself. My own opinion is (and I only give it as an opinion, though it seems to me that no one can arrive at any other conclusion), that these mycelia penetrate into the blood discs, which are the very life of the animal, suck out its substance, and appropriate it to their own

growth. In other words, that the growth of these plants is at the expense of the blood discs themselves.

There may be an additional cause. We are perfectly familiar with the action of yeast in solutions of sugar; and we know, equally well, that yeast is simply an aggregation in fluid of these minute cryptogamous plants. These yeast plants grow by feeding in the sugar, appropriating the substance of the sugar to themselves; then, when they have obtained all that they need for their own transformation, they excrete the substance known as alcohol.

Now, it may be possible that this plant, after feeding in the blood discs, may not require all the substances contained therein, and may, like the yeast plant, excrete some poisonous matter which may operate as a specific poison of the blood. In addition to the absorption of its nutritive properties, you may take either, or both, of these conjectures as an explanation, and one or the other, or both, account, it seems to me, most satisfactorily, for the fact that the growth of these cryptogams in the blood is the cause of this dreadful phenomenon.

I move my arm, and some minute part of the muscles is destroyed. In order to maintain my health a provision is made, whereby the wasted part is carried off through the circulation, by which the blood is purified, passing through the heart and lungs and is finally carried away. At the same time, in a healthy condition of the body, when a particle of disused matter is carried off by the current of the blood, the arterial blood darts in and a fresh particle replaces that which was destroyed; so it is in the hair, the eye and every other tissue of the body. The integrity of health, therefore, depends on the existence of pure blood in the body, and on the power of that blood to reproduce the wasted tissues of the system. When, therefore, a diseased animal moves, there is no drop of pure blood, whereby the vacancy may be filled; and when the effete and wasted portions are carried off, there is nothing to replace it; consequently the animal dies from waste and inanition. This disease has its foundation in the destruction of the blood, causing that decay in every portion of the body which I have described. It produces that fatty disintegration of the liver, the breaking down of the spleen and all the phenomena which I have described.

The next question that may be of interest is this—how is this disease communicated? how is it these spores pass from the sick

animal to the healthy animal and there take root and grow? There are various ways. I will not repeat what I have said to you regarding these spores, for I know you all understand what I have been saying. These spores are thrown out in the dung, urine, or any other excretion, and by and by we find them in every part of the body. Not merely the blood, but the bile, the urine, and all the tissues of the body, are found to be overflowing with them, each little plant striving to gain some nutriment from some important organ of the body. Again, these spores find a genial home within the sheaths of a great variety of grasses. They take root there and completely orrun them, so that a large area may become absolutely poisoned by the growth of these minute spores. When the cattle crop this grass, it is very easy to see how, entering into the stomach, these minute objects may be introduced into the circulating current of the blood, and thus become infused through the whole body.

We have tried this thing artificially. A great number of subjects have been fed upon small pieces of the diseased liver, spleen, etc. Some animals have been affected one way and some another. We have not gone through these experiments as thoroughly as we desired or intended to do. Thus far, we have only been able to reproduce the Spanish cattle fever in rabbits, but that we can do, with absolute certainty. After feeding for a few days on these spores, the rabbit has all the symptoms of the real cattle fever, and on dissection, the bile, blood and urine are found perfectly loaded with these spores. It seems to me that we have thus demonstrated the real foundation of this disease, but as this subject will be much more fully entered into by Dr. Morris, I will not go into details.

The question is sometimes asked why it is that Texas cattle will sometimes give the disease, and at other times will not. All of you, undoubtedly, have come prepared to detail to us most marvelous instances of this kind, for I have heard of such, all through the country, and from all classes interested in the subject. Take, for instance, the case of Mrs. Duke, of Kentucky. One hundred Texas steers were brought to her for pasture, and were pastured for three or four weeks, after which they were sold to a neighbor. She then turned in four hundred head of her own cattle, every one of which, after grazing upon these grounds, died. But Mr. Duncan, who purchased the cattle, put them on his own fields, with

his own animals, and not a single one was afflicted with the disease.

The explanation of this is very satisfactory to me. I can very well understand how the fresh, green pastures, and the cool, flowing waters of Kentucky, washed out all these spores from the animals, and, having thus become pumped, they were incapable afterwards of transmitting the disease.

You will recollect that in describing these cryptogamia, I have spoken of them as in various stages and conditions of development, but the spores must be in a given condition before they will develop into the large plants I have described. So, with Texas cattle; they may be full of these spores, which, however, may not be in a condition to develop themselves, and then their excrement has no hurtful quality, and our native cattle may pass over after the Texas cattle without any sort of danger. It is only Texas cattle who have the spores in their own bodies in such a stage that they may be developed in any other animals that are capable of communicating the disease.

Why is it so rarely the case that native cattle communicate the disorder? It is because the native cattle do not, in ordinary cases, develop these spores at the point where they are susceptible of propagation. That is the plain and obvious reason why these discrepancies exist, and why it is that sometimes Texas cattle will surely communicate the disease wherever they go, while at other times there is no danger whatever. I pass over these matters with as much brevity as I can, and I shall be very happy at some future time to explain the matter which gentlemen may desire, and in regard to which I may have omitted some point.

I now come to the most important inquiry of all, as to whether there is no mode of arresting contagion from Texas cattle; and, I am more than happy, gentlemen, that it is in my power to state, with a great amount of confidence, that we have such an agent. I have here before me specimens of carbolic acid, in various preparations, some containing forty per cent., ninety per cent., and here, in the third bottle, the heavy oil containing about 15 per cent. It is to this remedy that I wish to call the attention especially of the farmers of the west, for I do believe that they have in it a real and true friend.

It is wonderful what the influence of this carbolic acid is; and I don't know that I can better illustrate its wonderful power than

to tell you the effect it produced at the bone-boiling dock in the city of New York. The most of you must know the intolerable stench generally issuing from such a place. I have seen there twenty horses brought in at once, in various stages of putrefaction, reeking with unbearable odors. I have sprinkled lightly over them this acid, and the whole of this disgusting effluvia was gone at once. Put those putrefied and corrupt bodies—horses, pigs and hogs—into the boiling-tank, and there is not the least odor therefrom. The fat is all tried out, and there is no more scent of that corruption than there is scent of corruption in this assembly to-day. Take one of those stinking livers out of the furnace in which it has been tried out; break it open, and hold it directly under your nose, and you will pronounce it perfectly sweet.

Gentlemen may smile, but it is a positive fact; and if you will only try it, you will find my statement verified.

If I am correct, gentlemen, as far as I have gone, and if I have succeeded in satisfying you with regard to the true nature of the disease, it follows that if we can destroy these spores, which I have shown to be the true cause of the disease, as I believe, we blot out the cattle fever. And I here state, gentlemen, that carbolic acid will destroy these spores. If you can only moisten them with this acid daily, you will render them utterly incapable of propagating themselves. The difficulty, of course, is, that you cannot thus go over your fields and pastures.

The expense of the dead oil is but a trifle, for it is sold in the city of New York at eight cents a gallon.

Gentlemen, I have some notes here with regard to the value of this antiseptic, and as I believe they will be of interest to you, I will, with your permission, read them:

The advantages of carbolic acid over other allied substances are, that it destroys the causes of the disease, while the others are mainly concerned with its accessories. A small quantity of it answers the purpose. It is cheap. It is volatile, and therefore attacks the minute spores that are floating in the atmosphere, and are the chief disease-producing agents.

I have given a conjectural theory of the disease when speaking of its essence, but it is by no means certain that it is the true one. Yeast is the ferment with which we are most perfectly acquainted. This plant, as I have said, feeds upon and assimilates the sugar contained in the fluid, where it grows, and throws out alcohol as

an excrement. There may possibly be a similar excrement from this plant, which is believed to be a *Tilletia*, and the morbific virus may be this excrement.

However the true source of the morbific virus may be subsequently settled, it is certain that carbolic acid destroys the vitality of the plant, and thus arrests the propagation of the disease. It is not yet fully settled that it has the power to arrest the ravages of the disease when it has once obtained lodgment in the body of the animal. In other words, it is not known to have the power of restoring or replacing the broken-down blood corpuscles, or of rendering the specific poison (if there be any) innocuous.

The following experiments by Mr. Crooks throw much light upon the action of carbolic acid on vegetable and animal tissues:

1. Some meat was hung up in air till the odor of putrefaction was strong. It was then divided into two pieces. One was soaked for half an hour in chloride of lime solution, and was then washed and hung up again; the offensive smell had entirely gone. The other piece of meat was soaked in a solution of carbolic acid, containing one per cent. of the acid; it was then dried and hung up. The surface of the meat was whitened; its offensive odor was not removed, though it was masked by the carbolic acid. In two days' time the bad odor had quite gone, and was replaced by a pure but faint smell of carbolic acid. In a few weeks' time the two pieces were examined again. The one which had been deodorized by chloride of lime now smelt as offensively as it did at first; whilst the piece treated with carbolic acid had simply dried up, and had no offensive odor whatever. It was then hung up for another month, and examined; no change had taken place.

2. A piece of fresh meat was soaked in one per cent. aqueous solution of carbolic acid, for one hour. It was then wrapped in paper, and hung up in a sitting room in which there was a fire almost daily. At the end of ten weeks it was examined. It had dried up to about one-fourth of its original size, but looked and smelt perfectly good and fresh—a very faint odor of carbolic acid being all that was perceptible. It was soaked for twenty-four hours in water, and then stewed, with appropriate condiments, and eaten. It was perfectly sweet, and scarcely distinguishable from fresh meat, except by possessing a very faint flavor of carbolic acid, not strong enough to be unpleasant.

3. Cheese-mites were immersed in water, where they lived several hours. A few drops of a solution of carbolic acid, containing one per cent., added to the liquid, killed them instantly.

4. An aqueous solution of carbolic acid was added to water in which a small fish was swimming. It proved fatal in a few minutes.

5. A very minute quantity of a weak solution of carbolic acid was added, under the microscope, to water containing various infusoria, such as bacteria vibrios, spirilla, amœbæa, monads, englenæa, paramecia, rotifera and vortecellæa. The acid proved instantly fatal, arresting the movements of the animalcules at once.

These animalcules are the almost invariable accompaniments of putrefactive fermentation. The above experiment has been tried with putrid blood, sour paste and decayed cheese, and in every instance the destruction of vitality and the arrest of putrefaction have been simultaneous.

6. Caterpillars, beetles, crickets, fleas, moths and gnats were covered with a glass, the inside of which was smeared with carbolic acid. The vapor proved quickly fatal. Dr. Elisha Harris confirms the deadly effect of carbolic acid on the common house fly. Dr. Lemaire and other observers testify to the effect of it upon ants and their eggs, lice, bugs, ticks, acari, musquitoes, aphides, butterflies, earwigs, wood-lice, cock-chaffers, centipedes, and other insects of this size.

These examples show with sufficient clearness that carbolic acid has a very remarkably destructive effect upon the minuter forms of vegetable and animal life, and that it may be fully depended on to destroy all the fungi which are the causes of putrefaction.

There is a strong analogy between the European disease known as the rinderpest and the Texas cattle fever: both of them seem to be caused or at least associated with a growth of minute fungi in the blood and in the bile. Whatever influence therefore is proved to be exercised by carbolic acid over one disease, may be fairly inferred respecting the other. It is therefore instructive to know that in a shed very greatly infected with the rinderpest, the air was drawn through glass tubes containing trifts of cotton wool, in the expectation that some of the virus cells, supposed to be floating about in the atmosphere, would be arrested by the wool. The suction was continued for ten minutes. One piece of the infected

was then exposed for half an hour to the vapor of carbolic acid. Two apparently healthy calves were selected, and an incision being made beneath the skin, these pieces of wool were respectively inserted in each. The animal thus inoculated with the infected wool, which had been exposed to carbolic acid, remained perfectly well, but the other animal took the disease, and died in a few days. It is possible that the calf that died might have contracted the disease before the inoculation was made. We admit that the proof of the protective power of this acid. in this particular case, is not as strong as it might be, but as it is the only case of inoculation that has come to our knowledge, we give it for what it is worth.

The influence of carbolic acid in protecting cattle against the ravages of rinderpest, were very decided. No cattle, thoroughly and persistently protected by it, ever had the disease. As an example of a great number of cases, we give the following statement of Mr. Crooks, respecting the farm of Mr. Spence, at Smedley, near Manchester:

"I arrived here in December last, and instructed the attendants in the management of the disinfectant plan with carbolic acid and sulphur. It has been regularly carried out ever since. In January last the disease first appeared in the immediate neighborhood, and carried off about a dozen cattle from a farm, the sheds of which were not more than 500 yards from Mr. Spence's cows. A short time after, thirty beasts, 750 yards off on another side, were attacked, and the whole were swept off in rapid succession. A month ago the disease appeared amongst twenty-two in another direction, not more than fifty yards off, and the whole of these also died. Through all these cases occurring around him, the cattle of Mr. Spence, protected by carbolic acid, escaped the contagion."

A still more remarkable example of the protective power of carbolic acid is given by the history of its action on the cattle of Mr. Lowe, Smethweck Hall, Brereton, Cheshire, England:

"This farm is in the centre of one of the most affected localities in England. The stock consists of seventy-three animals; forty-five milch cows, kept in houses which have been regularly disinfected since December last; and fifteen two year old heifers, and thirteen yearling calves, kept in fields and open sheds. To these latter no disinfectant whatever has been used, owing to the impossibility of applying it satisfactorily to animals in the open air.

The disease prevailed very severely all round, but no case occurred at Mr. Lowe's farm until February, when one of the forty-five milch cows showed signs of illness. Immediate investigation was made, and it was found that one of the cow-men on the previous day had attended a post mortem examination of some diseased beasts, and having come directly to Mr. Lowe's house, afterwards had milked some of the cows. The man was, of course, discharged instantly. The succeeding day, February 20, the first cow that the man had milked, on the day of the post mortem, refused her food, and all the symptoms of the plague rapidly appeared. Two others in the same house were afterwards attacked, one of which recovered almost immediately and one was killed as a matter of precaution. A fourth case then occurred in another shed. On inquiry, I found that the first, third and fourth cows were those which had been milked by the discharged man. The second case, occurring in the same shed with the first and third, was evidently either developed from them, or was a case of infection brought from the calves mentioned below. These four cases are all that have occurred amongst the forty-five milch cows in the disinfected sheds. Up to the present date (April 25, 1866,) the rest are perfectly well. Their health indeed seems to be improved by the carbolic acid. The cows are very fond of it, and lick it from the wood-work or walls whenever they have an opportunity.

Previous to his discharge, and on the morning of that day, the same man was employed in preparing food for and feeding the unprotected fifteen heifers and thirteen calves. A few days after the disease developed itself amongst them, and in a fortnight they were all dead.

A crucial experiment has therefore been tried at this farm on the grandest scale. It was indeed supplied by accident, but it is none the less satisfactory and decisive. Although it far surpasses in magnitude any trial which an experimentalist dare institute, it fulfills every condition which could be demanded by the most rigid investigation. A farm is chosen in the very hot-bed of cattle plague. The cattle on it are divided into two lots, forty-five being placed in disinfected houses, and twenty-eight in undisinfected open sheds. The disease is brought into each lot on the same day, by direct inoculation of the virus. Of the disinfected animals only those actually inoculated fall a prey, whilst of those which are not protected by disinfection the whole are rapidly

swept off. It is scarcely possible to say anything which will add to the satisfactory nature of these results; but I may mention that of the ten farms immediately surrounding Mr. Lowe's, seven have lost the whole of their stock (amounting to 215), whilst on the remaining three the plague is gradually spreading through the herds.

Accident has carried this grand experiment a step further, with most striking results. A few weeks ago the remainder of Mr. Lowe's forty-five disinfected animals were turned out to grass, and at the same time were removed from the protecting influence of carbolic acid. Within a few days the plague attacked and killed the whole of them. The complete proof of the value of carbolic disinfection, which has been afforded at this farm, is cheaply purchased at the loss of all Mr. Lowe's stock."

In this connection I will state that the earliest herds affected, arriving in New York, were those sent forward by Mr. Alexander from Homer, in this State. Many of the animals were killed, and the few that Mr. Alexander had sold, he purchased back the moment he was acquainted with their sickness. Six of these animals were left in Jersey for an experiment. Though very much diseased, the experiment was tried of feeding them this carbolic acid, together with glycerine and soda, diffused through water so that it tasted very perceptibly. Careful chemical experiments were made each day after their being fed on carbolic acid. After the fifth day it was found that the fibrine of the blood was being renewed, and with each successive day that the treatment was continued the fibrine increased until nearly the normal amount was restored, the animals becoming perfectly well. I do not say that this is a cure, but I do think that instance illustrates very clearly the power of carbolic acid in arresting the disease. At all events, if it is not considered, as I do not consider it conclusive in the matter, it is well worth the while of every western farmer to supply himself with a barrel of this acid, which does not cost a great deal, and try the experiment himself. I find that I am getting exceedingly tedious, but I wish to say this in regard to the influence of this acid upon the rinderpest—that where catttle were surrounded on every hand by that disease, the hanging up of rags which had been soaked in this acid, through the stables where they were, entirely protected them. I do not think and I do not believe it possible that cattle sick with the Texas fever, could under any circum-

stances, communicate it to others, where the odor of carbolic acid is constantly diffused. At all events, we may state, as matter of fact and not as an opinion, that no animal has ever died where it has been faithfully used. It is also a very efficient remedy in many diseases and a specific for some. It is the best remedy for foot-rot in sheep that has ever been discovered. This, of itself, ought to be a sufficient inducement to you all to keep it constantly on hand. It is also the best remedy for ticks and scabs ever known, and especially with regard to these ticks I will say, since there has been so much talk of them in connection with the Texas fever, that they are killed as by a shock of electricity simply by rubbing lightly over them this same acid. It is one of the best of remedies for pleuro-pneumonia. It is also almost a specific for glanders in horses—the worst cases have been cured by it. For foul ulcers it is one of the most reliable of all remedies. If you desire to destroy unpleasant odors around your slaughter houses or privies, a very small amount of this carbolic acid will do it effectually, and that, too, for a month. Dr. Snow, one of the secretaries of this convention, who is the health officer of the city of Providence, has used it to a great extent in the disinfecting of drains, and he will add his testimony to mine.

In addition to this, it is a sovereign remedy for the whooping-cough, entirely removing those terrible paroxysms which are so much dreaded.

Now, in regard to the periods of incubation. I have obtained the following data:

Texas cattle were received on the Broadlands estate on the 31st of May, and no disease occurred among the native cattle until July 26th, a period of fifty-six days.

Col. Sullivant's cattle *via* Red river were received June 2d, and the disease did not make its appearance until Aug. 2—sixty days.

Mr. Gregory put Texas steers into a pasture with fourteen native steers on the 20th of June. The first of fourteen died on the 10th of August—fifty-one days.

Mr. Gregory put forty head of native cattle with the Texas cattle, on the 29th of July. On the 15th of August the first of the forty died—seventeen days.

John Morrel's first cow was exposed on the 29th of August; died on the 13th of September—fifteen days.

J. Morrel's second cow, exposed on the 29th of August, died on the 15th of September—seventeen days.

J. Morrel's third cow, exposed on the 29th of August, died September 18th—twenty days.

We have up to the present time no evidence that the disease manifests itself in less than seventeen days or more than sixty days after being exposed to the infection. Hence cattle that have been exposed to the disease should remain in quarantine for a period of at least sixty days.

Since considerable inquiry has been made in relation to them, and I have been requested to present them to the convention, I will now read our instructions to farmers; they are as follows:

1st. When the disease makes its appearance in any neighborhood, all the owners of neat cattle should make a point of examining each animal every morning. The chief points to which their attention should be directed, are the following:

The head; whether it hangs down, whether the eyes are dull and staring, whether the ears are drooping, whether the horns are hot or cold.

The coat; whether it is rough or smooth.

The urine; whether it is a dark red or black.

The hind legs; whether the gait is staggering and whether the knees seem weak.

The dung; whether it is natural or otherwise, and especially whether the animal arches its back and makes ineffectual efforts to dung.

See if there is any drooling of frothy matter from the lips.

If you have a fever thermometer, insert it into the rectum (bung), let it remain until the mercury ceases to rise, then note the temperature. If it is 102° Fahrenheit, and any of the above mentioned symptoms are present, you have good reason to suspect the presence of the Texan cattle fever, and the probability is increased by every additional degree of temperature.

It is very important that the dates be carefully observed of all the symptoms connected with the disease, and experience has shown that memory is very untrustworthy; by all means, therefore, let all the above facts be clearly *written down* as soon as possible after the observation is made.

Shut all suspected cattle in a lot or building by themselves, so that no other cattle can have access to them or to their droppings.

Send word as soon as possible to the nearest assistant commissioner of the suspected; if a telegraph is accessible send him word through its agency.

2d. Means of prevention.

When the disease is present in any neighborhood, every owner of cattle should be provided with a barrel of heavy coal oil which contains from eight to twelve per cent. of carbolic acid, and a quart of liquid carbolic acid, which contains ninety per cent. of the acid; the latter is mixable with water, the former is not.

If the suspected cattle are kept in a building, let the floor be sprinkled with the heavy oil, and especially let it be sprinkled on their droppings as fast as they are made. The wood work of their stalls, and behind their stalls, be covered with this substance, spread on by a common whitewash brush. The heavy oil may be sprinkled on the floor through a common watering pot. These articles are furnished by the Warren chemical manufacturing company, No. 4, Cedar street, New York.

If the suspected cattle be herded in a yard or small pasture, let the droppings be sprinkled daily with heavy coal oil.

Remember that strict isolation is the chief means of safety. Let no strange animal come upon the place. Let no suspected animal go on any public road nor have access to running water to which other animals go. The dung and urine of sick animals are the chief means of propagating the contagion, and it is known that it is often diffused by the dung which adheres to the shoes of attendants. A box containing slacked lime or ground plaster well saturated with the heavy oil, should be kept near the diseased animals, and all persons, when leaving the vicinity of such animals should carefully rub their shoes in the powder in the box.

3d. *Curative means.*—There is no certain cure for the disease yet discovered. Some animals get well without any medicine; others seem to have benefited by feeding in a salt marsh and on green corn.

In case you have the liquid carbolic of ninety-five per cent., which will mix with water, drop enough of it into a pail of water to give a slight taste of it to the water, and let them drink of it twice a day.

If you have nothing but the heavy oil, mix three ounces of soda with it, which will make it mixable with water, and put the mixture into a quart of water; pour enough of this mixture into a pail of water, and let them have two pails full a day.

Let the sick animals drink freely of water, as they are generally very thirsty; and place salt where they can lick it whenever they are disposed to do so.

With regard to food, follow the advice of the medical practitioner.

If carbolic acid cannot be obtained, dissolve two pounds of sulphate of iron (green copperas) in a gallon of water, and use the solution as directed for the heavy oil.

Bury them in a grave at least seven feet deep, and cover the carcass with a barrel full of quick lime; ram two feet of earth well down over the lime, and then fill in the remainder of the earth.

In regard to the burial of dead animals, you will permit me to say that one of the prolific causes of the spread of this disease has been the careless burial of animals that have died of it. By all means, if you value your herds, bury the dead animals carefully, and if you can throw a barrel of lime over them, all the better.

Now, gentlemen, the question is: What shall be done with the Texas cattle? Shall we, by law, utterly prevent their coming here; inflicting heavy pains and penalties upon those who import them? Is there any period of the year when they are not harmful, during which they may be permitted to come in, while we exclude them at other seasons?

With regard to all this, I am unable to say anything, because that is a matter in relation to which we have come here to be enlightened by you of the west. But one thing you must bear in mind, that is, this thing must not be tampered with. If it shall be proved that, by the introduction of Texas cattle, these broad and beautiful and fertile prairies are to be filled with these spores, that abound in the grasses of Texas, recollect that you are to give up cattle altogether; that you cannot raise them at all. You must settle that question definitively and honestly, looking it squarely in the face. If there is no time when Texas cattle can safely come in, then they must be excluded, painful as it is for me to say so, for cheap meat is what we want in New York, and,

from what I hear, our only hope of obtaining it is by importation of Texas cattle. But if their introduction is going to kill off all your herds so that you cannot supply us with any meat at all because of your prairies being so thoroughly poisoned, then it is for our interest to exclude them altogether.

You must consider the power of this parasite to spread, and also the question of its acclimatization in the grasses of this western country, and the possibility that your prairies will become so infected with this poison, as to be utterly worthless for cattle purposes.

In conclusion, gentlemen, I have some hope, and in fact a very strong one, that the ravages of the Texas fever may be somewhat circumscribed through the destruction of these spores by means of carbolic acid, and I am perfectly confident that they will be so circumscribed if you will but once begin the use of it. And then, again, it does not seem to me to be altogether hopeless that these spores may be destroyed, by means of carbolic acid administered internally, before they can be discharged upon your prairies.

Gentlemen, I apologize to you for trespassing so long upon your patience, and will close with this motion, that a committee be appointed whose duty it shall be to draft a series of propositions that may be enacted into laws by the legislatures of the several states interested in this matter.

Dr. Clendennin, of Ohio—Before the motion is put, Mr. President, I should like to suggest that that committee be composed of one member from each state and province represented in this convention.

The amendment was accepted, and the motion prevailed.

The President—The chair will consider it a favor if the delegation from each State will suggest one of its members to act upon this committee. I will appoint the gentleman from New York (Mr. Gould) chairman.

Mr Chadbourne, of Wisconsin—I move that when we adjourn, it be till half-past seven o'clock this evening.

The motion prevailed.

The President—Before we adjourn, gentlemen, I would like to submit a communication received by the chair:

SPRINGFIELD, *December* 1, 1868.

To the President of the Stock Convention :

SIR—I have the honor to transmit herewith a copy of a resolution adopted by the Board of State House Commissioners, in compliance with their instructions.

Very respectfully, your obedient servant,
J. C. WEBBER.

Resolved, That the Stock Convention, now in session in this city, representing many of the states of the Union and Canada, be and hereby is respectfully invited to visit the grounds and examine the foundation walls of the new state house, now in process of erection in this city, stating a time most convenient to themselves.

The communication was received, the invitation accepted, Tuesday 12 M. fixed as the time, and the secretary directed to reply to the invitation accordingly.

Whereupon the convention adjourned, to meet again at 7:30 P. M.

—

EVENING SESSION.

THE PRESIDENT—Will the various delegations, as the roll is called, name the one of their number who shall serve on the committee for the purpose of drafting the law to be submitted to the several legislatures of the states and to the parliament of Canada.

The roll was called, with the following result: Ontario, Hon. D. Christie; Ohio, Dr. Wm. Clendennin; Maryland, Dr. Richard Mackall; New York, J. Stanton Gould; Rhode Island, Dr. E. M. Snow; Wisconsin, B. R. Hinckley; Michigan, Dr. M. Miles; Massachusetts, Dr. Thayer; Missouri, Dr. L. D. Morse; Indiana, James Poole; Illinois, Dr. Wm. Kile.

The committee was ordered to report in the shortest time consistent with the magnitude of the subject to be considered.

MR. CHRISTIE—Mr. President, as the subject matter before the convention was considered in but one aspect by the gentleman from New York (Mr. Gould), I would now suggest that the medical aspect be now considered by Dr. Morris, of New York; for I think that the convention generally are very anxious to hear him, and to see the illustrations which will accompany his remarks.

DR. MORRIS, of New York—I am not exactly prepared now, Mr. President, to go on. I would ask to be excused until to-morrow.

THE PRESIDENT—We shall be very glad to hear from the gentleman at his convenience.

PROF. CHADBOURNE, of Wisconsin—Mr. President, the paper presented to this convention by the gentleman from New York (Mr. Gould) was, in my judgment, a very important paper—covering a great deal of ground. And as it, in itself, presented to us points that can be considered without any special reference to the medical views of the subject, and as the gentleman who presented that paper said that he should be glad to answer any questions, there are two or three things that I should like to ask him about at this time. The gentleman, as I understood, seemed to think it possible that the grasses upon our prairies might become so infected with these spores that it might be almost impossible to raise cattle here.

Now, that sir, is a very startling theory, and I wish to know if he, or any other gentleman, is in possession of facts that tend to substantiate any such proposition or theory. I have yet to learn that any cattle have been infected by this disease by feeding upon any pastures over which a winter has passed between the time of Texas cattle passing over them, and native cattle feeding upon them.

Now I wish to ask this question: Suppose that Texas cattle have gone over a pasture and left there the seeds of a disease. After the winter has passed, is there any sort of danger that any other cattle coming into that pasture will be troubled with that disease?

On the other hand, has it not been proved by observation that a winter kills out, so far as the pastures are concerned, all seeds of the disease? If this be true, my own mind would be very much relieved, and I doubt not, of very many other persons who were startled by a theory which is certainly a very plausible one.

MR. GOULD, of New York—Would you like to have me answer that immediately?

MR. CHADBOURNE—If you please.

MR. GOULD—The interrogatory is a very proper one, Mr. President. I had in my mind what I suppose was an undoubted fact, but which has been to-day denied; and as I do not wish to give

any unauthentic fact to the convention, it may perhaps be proper for me to relate one of the circumstances upon which my statement was based.

Mr. Harvey Sandusky, states that a gentleman near Mattoon, Illinois, had, last fall, a number of Texas cattle pastured upon his land, and that after these cattle had been taken away, he drove in some of his native cattle, a very large portion of which were destroyed. As a burnt child dreads the fire, he was afraid to risk his cattle there in the spring. He, therefore, allowed the grass to grow up, and it did grow very luxuriantly. One of his neighbors who was short of pasture, desired to turn his cattle into that lot. The gentleman told him that he was afraid to turn his own cattle in; but the neighbor having no fears of that kind whatever—believing that a winter's frost was quite sufficient to destroy the virus which had been left there by the Texas cattle—did turn them into this pasture. The consequence was that twenty out of forty cattle which were turned in, took the Texas cattle fever and died this summer. That is the story as it was told to me.

Dr. Kile, of Illinois—Mr. President: I suppose that I know something about this case referred to by the gentleman of New York. The circumstances occured at Mr. Diller Dole's, five miles north-west of Mattoon, and were these: A year since Mr. Dole, who is a large land owner, rented a pasture to a gentleman who had a number of Texas cattle. These cattle remained there a month or two. Some gentleman purchased, say one hundred cows south of that point, and rented this pasture for them. I would say, by the way, that none of the Texas cattle had died. Mr. Dole rented it, and in August or September the cattle were turned in, and thirty-five out of seventy head died.

Mr. Christie, of Canada—Mr. President: In regard to Mr. Harvey Sandusky, I would say this, that I took occasion, with Mr. Stone, to come to Springfield, by way of Mr. Sandusky's, with him. He was asked in the presence of other parties in regard to this affair, and repeated the same story exactly as given by the gentleman from New York (Mr. Gould), and the parties present corroborated the statement. This statement was, that the cattle were brought to Mattoon a year ago this fall; were fed on this lot during the winter, and were sold in the spring. After they

had been sold, this neighbor, seeing the grass come up very luxuriantly, was anxious to avail himself of so good feed.

The proprietor of the lands, whose name I do not know, stated that he thought it was unsafe to turn cattle in there, and he didn't use it himself on that account. However, the other person treated the matter lightly; put his cows in there, and had lost twenty out of forty. That was the statement to Mr. Stone and myself; and moreover, I find the following statement in the "Report of Commissioners on the Texas Cattle Disease, to the Pork Packer's Association of Chicago, October, 1868," said to have been made to Captain Brown, one of the commissioners of the Illinois State Agricultural Society, by V. T. Chilton, of Smith City, Mo., on the 4th October, 1868: "I have never heard of but one herd that was wintered here that was diseased the next summer, and they may have taken it from other droves that were passing through the country." So that there is one case in Missouri where this thing has happened. In the other the cattle were brought into the pasture in the fall; were fed during the winter, and were sold in the spring; the cows following them the next summer.

Mr. Chadbourne — That is not the point, Mr. President. Is there one single case known where cattle have been removed from a pasture, there being no cattle in that pasture during the winter, and where animals put in that same pasture during the following season have been infected?

Dr. Morse, of Missouri—It seems to me, Mr. President, it makes little difference whether the disease remains over winter in or about the cattle.

Dr. Clendennin, of Ohio—It seems to me it makes a vast difference, Mr. President; for we can kill the cattle, but if the disease is in the grass, and continues there from year to year, we shall want a vast amount of carbolic acid to kill it out in these broad prairies of ours.

Dr. Kile, of Illinois—I have lived, Mr. President, in the county adjoining Coles county, and, having been acquainted with the gentleman referred to; I can say he is as truthful and responsible a man as we have; but I know he has been very much excited regarding this disease. I heard this same report, and as Mr. Dole was referred to, I made it my business to inquire of him. He told me distinctly that the cattle were put in in the spring, and taken out some time in the mid-summer; that the

pasture was afterward rented to this man, who was buying cows for the Chicago market, and who put them into that pasture—there being no winter intervening. I will further state that I made these inquiries for the purpose of being able to state to this convention, and being able to state to them, the exact facts. Mr. Dole further remarked that this scourge had been little felt there; that they had not allowed any Texas cattle to be unloaded at that point, and consequently had escaped the disease. I know, however, that Mr. O'Hare, the ex-sheriff of Coles county, brought there, summered and fed, and took to market, over one hundred head, without any disease making its appearance. Mr. Van Daren, a few years ago, brought in three hundred head, which were grazed, fed, and sold to farmers, without our ever hearing of any disease.

So far as I know, the disease has never appeared in Coles county, except in this isolated case.

Mr. Poole, of Indiana—I would ask the gentleman, Mr. President, if, in driving these cattle to pasture, they might not have been driven along the roads or trails or feeding grounds where Texas cattle had been before them, and thus been exposed in other places besides this pasture.

Dr. Kile—In reply to the gentleman, I would say, Mr. President, that most if not all of the cattle brought there came from Cairo direct. It is a section of the state where cattle are not driven from the south to the north. Mr. Dole told me that these cattle were bought in Marion county, which is almost due south from Coles.

Mr. Poole, of Indiana—Mr. President, it does not appear to me that a statement of this kind would be sufficient to establish anything positively; but I have a case in point where I know the facts myself. Mr. Earl, one of the commissioners from Indiana, is a very large dealer in cattle. He and his partner had a number of cattle brought direct from New Orleans by the river. They were re-shipped at Cairo, and brought to our town on the Wabash river, arriving in very bad condition. Having been brought up in steamboats, they were shipped to Attica, but were so crowded into the cars that they were trampled on, and some, to my personal knowledge, had to be pulled out of the cars, just alive, and so badly used up that they could not stand. Several died then,

while others were about in that condition for some time, and, when put in a stable and attempted to be cared for, nearly all died.

These cattle were pastured up and down the river a distance of ten miles, and were herded until spring in different pastures, among which was one of my own.

THE PRESIDENT—What time did these cattle arrive, sir?

Mr. POOLE—Some time about a year this coming January.

As I was about to remark, some of those cattle died in my field, and their bones lay there yet; and after they had cropped up that field, they were taken to other pastures up and down the river, nearly all of which they used up. To my knowledge, in not one of those fields—not a single one—has there ever been a case of Texas fever. In my own fields, I put in sixty head of fine fat cattle, when the disease was raging worst about our town—the result of unloading cattle there in July. Those sixty head of cattle were only half a mile distant from where the cattle were dying in town; not a single one was sick or died, and I don't know of a single animal that died, up and down that river, in case of cattle situated as mine were. But, regarding the lot that was unloaded and passed through our town about the 2d of July, two-thirds of the stock in our town died as the result, and so for all along this road, a distance of fifteen miles.

I do know that as far as those cattle of Mr. Fowler's were concerned, not a single case of Texas fever has occurred there. This I know to be a fact.

Dr. CLENDENNIN, of Ohio—Mr. President, as there does not seem to be anything particularly before the convention, I will give my experience in reference to the use of carbolic acid.

On the 3d of June, the last herd of Texas cattle were brought to Cincinnati over the Ohio and Cincinnati road, and were put into stock pens. They remained there over night only, and, on being inspected by our meat inspectors at that place, they were found to be very poor, and covered with ticks. They were ordered to be taken out of the pen and out of the city, as they were unfit for food, simply because they were so poor. They were taken to Jones' Wood pasture, eight miles from the city, where they were kept two days, and then brought back to the city. In the mean time there was a drenching rain, and the cattle were pretty well washed. They were put into pens at the Brighton stock yards, where they remained perhaps twenty-four hours, when they were

removed for the second time to Jones' Wood pasture, where they remained some three weeks, and were fattened up.

On one occasion some of these animals were stampeded when going to water, and broke into the grounds and gardens of the village through which they passed. The animals with which they came in contact, or that were kept on the grounds over which they passed, took the disease and died. These facts I know, for I followed out every single case myself.

These animals were finally spirited away, and killed, I presume, for the Cincinnati market; as they were outside the city limits, our inspectors claimed that they had no control over them.

Within ten days after the herd was removed from Jones' Wood, 29 cows were put into the same pasture, where they remained, I think, about a month, when the owner observed that the animals were ailing and the symptoms described by the gentleman from New York (Mr. Gould) were perecisely those presented by these animals; that is to say, the first manifestations were drooping of the head and ears, and that marked stare, which he so well described. In the early stages of the disease the animal sought the water, lying down in it, and plunging in the nose and face up to the eyes, holding the head in that position as long as was possible without taking breath. This was only during the early stages of the disease. During this time, the temperature of the body was increased, as proved by actual observations made by the thermometer. They would then leave the water, and within four days from the time of the attack every single one of them died. I examined 24 of those 29 cows—every one of which died within ten days. I did not find any disease of the rectum, as Mr. Gould has described; that I found perfectly healthy. If there was any change, it was perhaps a little paler than natural. I found one symptom to which the gentlemen did not refer—(interlobular emphysema)—infiliation of air between the lobes of the lungs; that existed in every case, and in some cases was very marked.

There were two cows, that were particular favorites of one gentleman, who desired to save them. They were but slightly affected—and his own opinion was that they were not at all. He took them from the herd and put them in a lot near his house, in which were two pet cows, which had been kept entirely separate and apart from the Texas cattle, nor had they been brought in contact with his own diseased cattle until those two cows, on manifesting the

first symptoms of the disease, were put into the lot with them. These two cows were put on the carbolic acid treatment, suggested by the commissioner from New York, (Mr. Gould) through the instance of the same gentleman who first proposed this treatment in this country. By the way, this remedy was used very extensively, as you are aware, in Great Britain, and in the north of Europe at the time of the prevalence of the cattle disease there. I refer to Dr. Haines, with whom I was in communication at that time. Carbolic acid was used externally, diluted, and internally, in combination with soda and glycerine. The life of those two cows was, perhaps, prolonged by this treatment, but they died within a week, although the fluids and food which they took contained carbolic acid in some form, diluted.

The two pet cows were also put upon carbolic acid water as a beverage; their hides were sponged over twice a day with a solution of it, and yet, sir, they died. On examining them I found the symptoms almost precisely as the gentleman has described here to-day. Now, there is one case of the use of carbolic acid in which the animal lived, perhaps, fourteen days or two weeks only, though taking carbolic acid from the first manifestation of the symptoms. I do not mention these cases to prevent gentlemen from using this remedy, for I believe it is one of the best remedies we have for many diseases, but I wish merely to direct the attention of gentlemen to the fact that it is not, perhaps, as reliable as some suppose.

The other case in which I used carbolic acid was in that of a cow kept by a gentleman for his own private use. The animal had every care and attention, and the acid was used thoroughly and persistently. During her sickness the gentleman required his dairy woman to milk the cow every day, to relieve the udder, and add to the comfort of the animal. The cow was a very good milker, but on the second or third day previous to her death, she yielded, perhaps, a pint. The gentleman had two full grown Maltese cats, which he was in the habit of feeding himself, but being in a hurry in the morning, he directed the servant girl to feed the cats, (who always ate breakfast at the time he did) with milk. He did not intend that they should have the milk from the diseased cow, but the girl so understood it, and gave it, and those cats died on the third day subsequent. They were found, on careful exam-

ination, made by myself, to present all the symptoms of the cattle disease.

Gentlemen using carbolic acid should bear in mind that it is a very active agent. It will take the skin off the animals as well as in human beings, and it should be used with caution, and then only when largely diluted.

Dr. Miles, of Michigan—Allow me, sir, to ask a question. Was the temperature of these animals taken at the time the carbolic acid was administered?

Dr. Clendennin—Yes, sir.

Dr. Miles—What was it?

Dr. Clendennin—It a little exceeded 103.

Mr. Poole, of Indiana—Mr. President, as this seems to be rather a class-meeting, for the purpose of informing one another what we know, it may be well enough for me to state a theory prevalent among cattle men, in regard to this disease, and that is, that cattle must necessarily pass over a trail, road or pasture, over which Texas cattle have passed, and that otherwise they cannot take the disease, and that it cannot be taken across a fence. Now, sir, as I remarked, it was between four and six weeks after certain cattle passed through our town, before our cattle commenced dying. I quit my business, and until the disease entirely ceased, I saw nearly every case that died in Attica. This happened in one case: In a field right opposite the depot where the cattle were unloaded, were a two-year old heifer and its mother; had been from early in the spring. They had never been out, never were out until the cow died, and I don't know but what the heifer is there yet. These cattle, as they were unloaded, passed right along close by the fence into the other part of the town, and so on east. This cow, which was a very fine one, weighing 1200 or 1400, took the disease. First, ticks were discovered upon her; in a short time she began to show symptoms of the fever, and some two or three days after its first manifestations, she died. The heifer all the while kept along by its mother's side, and was by her when sick, but was itself never sick, though it had these ticks.

This case proves conclusively to my mind that the Texas fever may be taken across a fence; that it may be taken without cattle passing over the same ground or trail, or eating from the same grass where Texas cattle have been. Now, from what my friend (Dr. Clendennin) stated, about the cats eating the milk and dying,

it would look very much as if any thing using the milk would die. There is, in my town, a certain maiden lady, very well off, in personal goods, and who owned a cow. The cow was taken sick, and the morning, or the evening, I think it was, after being attacked, the lady discovered something unusual about the animal. The cow was milked and gave a small quantity—not as much as it was in the habit of giving, which was as usual strained and put into a crock. The next day the cow was found to be very badly off, and the day after, it died. The lady had some preserves that she took a fancy to eat, and without thinking anything about the cow being sick, she took the cream from this milk and ate it with her preserves. A day or two after that she was taken quite sick, and upon thinking about the cow dying, and her having eaten this cream with her preserves, she came to the conclusion that as likely as not she was going to die with the Spanish fever, and not having her affairs in exactly the state that they ought to be, she sent for me to make her will. I went to her and got directions as to how she wanted to dispose of her property; rather made sport of her that she was more scared than hurt, and that there was no danger of her dying, but she said that she didn't feel well, and had a congestive chill or something of that kind, and wanted to make a will. I made her will. The next day she was about, as well as ever, and has never been sick since. I am satisfied that the cream from the milk of that cow, had no effect whatever upon her.

Dr. Johns, of Illinois—I should like to ask the gentleman. Mr. President, if a post-mortem examination was made of that cow?

Mr. Poole—No, sir, but the cow exhibited exactly the same symptoms as the other cattle who died of the Texas fever, and the disease proved fatal in very nearly the same length of time and a little earlier than in some cases.

Prof. Chadbourne, of Wisconsin—I should like, Mr. President, to ask the gentleman, as his statement is a very important one, if these cattle passed along the side of the field in such a manner that there was no possibility of this cow coming in contact with them, or if the land was in such a position, that, as rain fell it would wash from their track into it?

Mr. Poole—The only way, Mr. President, that they could come in contact, was by one or the other pushing the nose through

the fence. That of course might have happened, but I don't know whether it was the case or not.

So far as the ground was concerned, it was about as level as this floor, and I wouldn't say which way the water would go, but would rather think that it would run from the field.

I know, also, that instead of the water that the cattle in that field drank, running into it, that it ran out of it.

THE PRESIDENT—As this tick matter has been mentioned, the chair would ask permission of the convention to make a little statement regarding it.

On my farm, which is composed of several hundred acres, and in the country thereabouts, when the land was first cleared up, until the stumps were worked out, wood ticks were very abundant in the spring of the year. And on one of my outlying pastures, consisting of 100 or 150 acres, where some trees grew and stumps yet remain, the horses and cattle, when turned out in the spring, are so infested with these ticks, that we are obliged to get the animals up every few days, rub them over with crude oil or something of that kind, and scrape off these pests. They sometimes become so troublesome as to cause sickness. They annoy the horses the most, but get on the cattle to some extent. After five or six weeks, when it becomes hot and dry, the ticks all leave.

I only speak of this as showing that it is barely possible that ticks can propogate this disease, for they are in the grass, and as the cattle and horses feed, they crawl off on their noses or upon their bodies when they rub against stumps. We then never considered them as dangerous, though they are very annoying, as they get fastened in the hair of the animal und suck its blood. But when I have heard the tick spoken of as being the cause of this disease, I am free to confess that I thought it was nonsense, because ticks abound all over western New York, Canada, and I don't know but here, though perhaps not in your prairie country. But I take it that on wooded land, there are plenty of them in the spring and early part of the summer.

DR. KILE, of Illinois—I, for one, Mr. President, and I know that is the case with very many members of this convention, would be pleased to hear from Mr. Eaton, Mr. Alexander's superintendent, who has certainly had as much experience as any one man regarding this disease.

THE PRESIDENT—Mr. Eaton, will you be kind enough to come forward and let us hear from you?

MR. EATON—I am not a member of this convention, Mr. President, and as I did not expect to be called upon, I have not prepared any remarks whatever, but I will be very glad to give my experience and I will do so in as intelligible a way as I can. I have had more or less to do with this disease ever since it made its appearance in Illinois; and have gathered a few facts, part of which I have retained in my memory, and part of which I have committed to paper, that I might not forget them.

I might remark, before commencing with this year's experience, that last season we grazed upon the Broadlands farm, about 500 Texas cattle, a portion of which had been wintered in Missouri and a portion on the farm. We grazed these last summer, mixing them promiscuously with 4000 native cattle in the different pastures, and there was no appearance of the disease last season—1867.

This season we commenced receiving Texas cattle on the 31st of May. The first lot came up the Mississippi river by way of Cairo; were unloaded from the Illinois Central road, at Tolono, and were driven to the farm. We continued to receive different lots, weekly and daily, almost, nearly two months. I observed when the cattle first began to arrive at Tolono, that they were covered with ticks—and I mention this now as the tick question has been alluded to by several gentlemen. The cattle were driven to pastures, and I then observed further, that about ten days after we put the cattle into the pastures the ticks disappeared entirely.

THE PRESIDENT—How thickly covered with ticks were these animals, Mr. Eaton?

MR. EATON—I could not say, sir, just how many there were, sir, of course, but I think some had 10,000. In many places where the animals could not rub them off, as in the flanks and crotch, they were almost as thick as they could be.

THE PRESIDENT—Did these ticks keep growing and falling off, Mr. Eaton?

MR. EATON—When they became gorged with blood, they fell off, sir.

THE PRESIDENT—Not until then?

MR. EATON—Not until then; finally they all fell off, and I thought no more about them. But about the 25th of July, I discovered that small ticks, in countless numbers, were making their appearance through the pastures where the Texas cattle were grazing, particularly in the vicinity of their watering places, on posts against which they rubbed themselves, etc. I discovered myriads of them on the grass, all over the pastures, and in such large numbers and so generally distributed that it seemed to be impossible for the cattle to graze without eating millions of them. They were very minute, so small that you could hardly observe them with the naked eye, and in fact I could not see them plainly without the microscope. They seem to belong to the same class of insects as our native ticks, but differed in appearance; I supposed them to be a variety of the same species. Those little ticks made their appearance about the 25th of July, I think, being about two months after the first Texas cattle were brought there. In a day or two this disease made its appearance, and then both Texas and native cattle were again covered with these insects. When first discovered they were very small, but soon began to grow, and when gorged with blood, fell off as in the first instance—most of the cattle having a second or third crop. Attaching themselves to an animal, and hardly discernible to the eye, they would, in the course of two weeks, grow very large, drop off, and then, as I suppose, reproduce themselves.

The fact that the disease made its appearance simultaneously with the small ticks, led me to think that they might have some agency in causing it, but whether they did or not, I don't know. But, as corroborating my supposition, I would mention the fact that we had a hundred oxen that were exposed to almost every Texas animal that arrived on the place up to the 1st of July, when they were removed (merely accidentally, as I had no fear or thought of disease) to a fresh pasture where there were no Texas cattle and where none had been. These oxen remained in the fresh pasture about two weeks, when, having occasion to use them on another part of the farm, I took twenty-eight, brought them to the house and worked them some time, grazing them at night, or when not working, on pastures that Texas cattle had crossed over. Every one of those twenty-eight oxen sickened, and most of them died within two weeks after I brought them out of the fresh pasture; while the seventy-two that remained have never shown

any symptoms whatever of the disease—although treatment, as to food, water, work, etc., was the same in every respect (except the exposure to the Texas trail after July 1st,) as was that of the twenty-eight that sickened and died.

About the 1st of July, there occured in my neighborhood, and under my own observation, three instances where portions of herds of native cattle, that had been grazed on Texas trails, were removed previous to that time to fresh pastures. Those escaped all sickness, while the remainder that continued to graze over this ground sickened and almost all of them died. I have several other cases similar to that, and I am convinced that if all the native cattle in our country exposed to the trail of Texas cattle had been removed therefrom, previous to the 1st of July, we should have had no Texas fever.

So far as the ticks are concerned, I believe those are the only actual cases that I have; but there is one similar, which I will relate. In Indiana, about two hundred Texas cattle, that I had something to do with, were put into a pasture where there were about a hundred natives, where they remained for about two weeks. At the end of that time about one-half were removed from that pasture to another, some twenty miles away—being driven over the herding grounds of the cattle grazing through that country, and put into another pasture with natives. The native cattle in the pasture where the Texas cattle first were, sickened and every one of them died; whilst the native cattle in the pasture to which the Texas cattle were transferred, remained healthy. That was Dr. Jones' case. The Texas cattle, when put into the first pasture, were covered with ticks, but by the time they were removed to the second pasture the ticks had entirely disappeared, so that those cattle, being at that time free from them, had no opportunity of catching the small ones, when hatched, as did the cattle which remained in the first pasture.

The President—Do you know, Mr. Eaton, that the cattle died of the Spanish fever?

Mr. Eaton—I know, sir, that it was the disease called the Spanish fever—precisely the same one that has been described here. It occurred to me, when listening to Mr. Gould's remarks, whether the spores that have been discovered in the cattle could not have had some connection with these small ticks, that I know the cattle were eating all the time. I am not scientific enough to

know whether such a thing is possible, as that the ticks eaten by these cattle may have some connection with these spores.

Dr. Kile, of Illinois—Pardon me for interrupting you, Mr. Eaton, but I would like to inquire whether cattle driven from Texas are infected with these ticks, or those only which have been transported by way of the river.

Mr. Eaton—I will give the gentleman my experience, Mr. President. We had on that farm some cattle that came up the river from the south, and also some driven across the country to Abilene, and shipped by rail from there. As far as my observation goes, the Abilene cattle were entirely free from ticks; and I do not believe, myself, that any cattle coming into our county from Abilene have communicated this disease; for I have not any knowledge of such a case, and cannot hear of any from authentic sources. I do not say, at all, that this is because they were clear from ticks, but the fact is certain that they were, and I don't believe that they have communicated this disorder.

With regard to my experience of Texas cattle in former seasons, it is this: that there is no danger of the disease after the cattle have wintered here; and this is also the belief of those around us. I know that last summer several herds of Texas cattle grazed all about us that had been brought into that region of country the previous fall and wintered there. They imparted no disease, whatever.

I have also been lead to believe, from my experience, that there is no danger, whatever, of this scourge being communicated after severe frosts, and my experience this fall proves it; for what native cattle we have on the place now, have been mixed promiscuously with our Texas cattle since the first of October. I considered it rather a dangerous experiment to allow them to be in such close proximity at so early a date; but I was very anxious to make the experiment—whether it would then do to intermix them. I did do so, and they have been running with the Texas cattle since about the first of October, and we have had no symptoms, whatever, of the disorder in our place since then.

If there are any further questions that gentlemen wish to ask me, I shall be very happy to answer them.

Mr. Stockdale, of Ohio—How is it, Mr. Eaton, about sucking calves not dying when the mothers have the disease?

Mr. Eaton—There are cases of that kind; I have known such. My experience has been that a greater percentage of old than of young cattle are affected with the disease. I think that observation warrants me in saying that the percentage of deaths is greater in proportion to the age of the animals. Very few calves died through the country. They almost all escape, and so do perhaps fifty per cent. of the yearlings; twenty-five per cent. of the two year olds, fifteen per cent. of the three year olds, and so on. As you advance in years, the percentage of deaths is much greater. That I found to be the case, not only only on the farms I had charge of, but also in that entire section.

Mr. McCoy, of Kansas—Mr. President, I would like to ask the gentleman how many Texas cattle he had on his farm, and how many native?

Mr. Eaton—We had some forty-six hundred odd Texas cattle on the farm during the summer, and in the neighborhood of six hundred native from first to last, mixed together promiscuously, without any attempt at all to keep them separate.

I will say, by the way, that I have seen ticks on calves; and perhaps I may as well say that out of the hundreds of sick animals I have examined, I never saw one that did not have more or less ticks on it, though in many that I examined it was very difficult to find them. For instance, my neighbor, Mr. Sullivant, came to me one day, after I had been talking about this matter, and said that I would have to give up the tick theory; and was so much in earnest about it that he said he would give me a dollar apiece for every tick that I would find in a cow of his just dying. So I went down to see, and took my microscope with me, and after some considerable search, I began to find the insects, and in such numbers that it would have taken all his Texas cattle to have paid me if he had lived up to his bargain. [Laughter.] I found myriads of them, though I could hardly discern them, with the naked eye, until I found their haunts.

Dr. Rauch, of Illinois—Mr. Eaton, will you please to state whether it was a microscope, or simply a magnifying glass that you made use of?

Mr. Eaton—A magnifying glass, sir.

Mr. McMillan, of Ohio—One of your answers, Mr. Eaton, is calculated to leave the impression that no cattle have ticks except those transported by public conveyance.

Mr. EATON—I never saw any ticks, sir, on those that came from Abilene, but I did not say that there were not any. My supposition about that is that they were originally covered with ticks, but shed them on the way, and had no opportunity of getting a second crop as they passed along.

Mr. CHRISTIE, of Canada—Do you say, Mr. Eaton, that no cattle coming by way of Abilene communicated the disease?

Mr. EATON—No case ever came within my personal knowledge, sir. I could not say that the Abilene cattle brought on the place communicated the disease, because in coming they passed a trail of southern cattle, and on that trail cattle died. I could not say that the Abilene cattle did or did not impart the disease, for it might have been them or it might have been the others, but my observations led me to think that the Abilene cattle did not, from the fact that I put them into a pasture where there were natives, who did not contract any disorder from them.

Dr. KILE, of Illinois—Will you be kind enough to tell us, sir, if you know, from what portion of Texas these cattle that came from the south were?

Mr. EATON—I think the most of them were, perhaps, from what would be termed the lower Brazos river, from the southern tier of counties on that river, and a few from the "Musquit" country. That was the information given me by the man who brought them here.

DR. KILE, of Illinois—Can you tell us, Mr. Eaton, from your experience, whether the Spanish fever has ever been communicated by stock brought from northern Texas?

MR. EATON—I do not feel competent to answer that point, because I have never known so much about the localities they are brought from.

DR. CLENDENNIN, of Ohio—Do you know of any case, Mr. Eaton, where the disease has been communicated from native cattle to native cattle?

MR. EATON—No, sir. If the tick theory holds good, however, I can see no reason why native cattle should not communicate the disease to native cattle, as well as Texas to native, if we only give time for the ticks to mature. If the ticks drop off on the grass they reproduce themselves, and if they get on any other native cattle they will certainly infect them.

MR. EMERY, of Illinois—It takes about ten days, does it not, Mr. Eaton, for the large ticks to produce the small ones?

MR. EATON—No; my experience is that it takes about two months. From six to eight weeks after the larger ones fall off, the little ticks make their appearance. In regard to the twenty-eight oxen that took the disease, death ensued, in the fatal cases, within two weeks, and in more cases ten days from the time they were exposed the second time to the Texas trail.

THE PRESIDENT—Did they have any ticks?

MR. EATON—Yes, sir, those that died were full of them.

THE PRESIDENT—Were those cattle opened, and if so did you find them to contain ticks?

MR. EATON—They were opened, sir, but we found no ticks inside.

THE PRESIDENT—Were the paunches opened?

MR. EATON—Yes, sir, but we could not, with the naked eye, discover any in the intestines, nor could we with any magnifying glasses that we had. I would say that we nowhere found destruction of the tissues. No case that came under my observation had proceeded so far as that.

DR. RAUCH, of Illinois—Will Mr. Eaton please state why, in his opinion, sucking calves do not die when the dam is diseased?

MR. EATON—No sucking calves died on my hands at all. I had a number of cows die that had sucking calves, and I supposed that the calves would die, as we had no milk to give them. I had so much other business to attend to that I did not give them any special attention, and, very much to my surprise, they all lived. They all ought to have died, really, according to the general order of things, [laughter] and this was the case with almost all of my neighbors, who lost their cows and saved the calves.

DR. RAUCH, of Illinois—If Mr. Eaton will pardon me, I would at this time like to make a statement with regard to the use of the milk of cows suffering with the Texas fever.

MR EATON—Certainly, sir.

DR. RAUCH, of Illinois—As the poisonous effects of the milk obtained from diseased cows has been alluded to, I would state that, so far as my observation went, no apparent injurious effects upon the health of individuals followed the use of it, having made special inquiry in regard to the same. In a great many instances that fell under my notice, especially among the poorer classes of inhabitants of the 5th ward of the city of Chicago, where a great many cows died, the milk was used almost to the time of death,

and in some cases as long as it could be obtained from the cow, without any immediate bad results. This was the case where the animals were not seen by an officer of the board of health or myself before death, as instructions were always given to throw the milk away, lest injury might follow its use.

MR. EATON—Since the gentleman has touched upon that point, Mr. President, I will relate my experience in regard to that matter. When the disease first made its appearance, it usually attacked our milch cows, and it seemed to be more fatal among them than any other cattle. I continued to use the milk very freely as long as we got any, and did so without thinking there was any danger. I suppose if I had taken any thought, I would not have done so, but I did use it until the cows dried up, and that, too, without any bad effects at all.

MR. CHRISTIE, of Canada—Mr. President, there is one point which I think especially worthy of notice. From what fell from the gentleman (Mr. Eaton), it may be inferred, so far as his experience goes, at all events, that cattle which came by way of Abilene did not contaminate others. Now, I will simply say, for the information of Mr. Eaton, and others who have heard his statements, that, in this very county, the Canadian commissioners in the month of August found this disease to have been imported by cattle brought by way of Abilene, and that, too, on the farm of Mr. McCoy, one of the proprietors of the stock yards at Abilene. We visited his farms in August, found several dead, saw three die, and held twelve post-mortem examinations. One of those cases was certainly among the very worst that we saw during the whole of our tour.

I find in the report of the commissioners sent out by the Pork Packers' Association of Chicago, and to which I have already referred, the following statement:

"Our next point was at Abilene, where extensive arrangements for handling and shipping this class of stock had been made by J. G. McCoy and Co. These yards were completed and ready for use September 5, 1867, after which time, in that year, about 1,000 car loads of Texas cattle were received and shipped east from them. From all we could learn there was no disease communicated from any of the cattle received at that point to the native stock of the neighborhood. The disease not following these cattle, in a measure threw people off their guard, and with the early

spring of the present year, active preparations were commenced by the drovers for a large business in this class of stock. The journey overland was made with more than usual expedition in many cases, to take advantage of an early market—the first shipments being made June 10th; and up to the time of our visit over 900 car loads had been shipped east. We found on our arrival at that point that the disease had recently broken out among the native stock, and scarcely an owner was found who had not lost more or less. Post-mortem examinations showed the same we had found elsewhere." Then, following that, we find: "On passing over the Smoky Hills we came to a herd of cattle, where we found a Texas steer, which had died during the night previous, not yet cold. The animal was carefully examined, showing the same general appearances that had been seen elsewhere in the native stock. There was the absence of bloody urine. There is no doubt that the animal died of the same disease that has affected the native stock." Then, in commenting upon their experience, they say: "Thus we found on the borders of Kansas the disease developed in the Texas stock, which we failed to find in the whole of our trip previously, through Missouri, Illinois and Indiana."

I think these facts, as there stated upon experience, establish beyond all question this, that the disease is communicated quite as rapidly by cattle brought by way of Abilene, as by those brought by more southern routes and from Cairo by the Illinois Central. This point I wished to refer to in order that there might be no misapprehension on that point, as seems to me to be very common, because if it can be shown that these cattle, brought from southern Texas and northern Texas, have the same power of imparting disease, then the precaution should extend to one route as well as to the other. In fact, the case which we witnessed to-day was that of a steer brought from Abilene; and although it was said to be a Texas steer, my impression is that it was not full-blooded. At all events, if it was brought from Texas at all, it was brought by way of Abilene.

Mr. Eaton—With permission of the convention, Mr. President, I would like to make one remark.

The President—Certainly, sir.

Mr. Eaton—I gathered from the remarks of Mr. Christie, that he understood me as saying that Abilene cattle communicated no disease.

MR. CHRISTIE—No, sir; not at all.

MR. EATON—What I desired to say, Mr. President, was, that no case had come under my observation.

MR. EARLE, of Indiana—Mr. President, our firm in Indiana have been handling Texas cattle for the last two years. The first lot, some 300 head, we purchased in Chicago, about the 1st of October, 1867. We drove these through the country to our farm, sent our man back, and bought about the same number—350, I think.

Our young man then went to New Orleans, and there purchased three hundred, getting them up the 1st of January. We unloaded them at Attica. All except eighteen, that were badly bruised, and that we lost, we finally took to our farm along in February, and mixed them up during the winter and all the summer with our native cows; and when the spring opened they were all very healthy, and took on flesh. They were very fat, and a great many cattle men came from a distance to see them. I believe the stock men agreed that they were as fat a lot of cattle as were ever seen in the west.

This spring we purchased 2,000 cattle, to be delivered at our place in June; but part arrived there about July, the second thousand reaching us about the 20th. Those cattle have done very well, are very healthy, weigh over 1,100, and are taking on flesh. We have mixed them with our cows and oxen without any damage.

At the same time, early in the spring, we sent a young man to Texas, who bought 600, and shipped them up. At the same time we bought about two hundred and fifty at New Orleans, that came up at nearly the same date. The first lot arrived from New Orleans about the 15th of May; the Texas cattle got through about the 1st of June. We kept them where there were some cows and oxen exposed, and they died—eleven head; and that was the extent of the loss on our place.

My experience accords with that of Mr. Eaton: that the Texas cattle were perfectly healthy; they did not affect our oxen or cows.

As to the ticks, there were but very few to be seen on the Abilene cattle. The southern cattle had great numbers of them. Some of the animals that came through from Texas were so infested with them in the flanks and between the hind legs, that

you could not put a pin down without touching one of them. They looked almost as if they were on top of each other. Texas cattle did not seem to mind them, although they disturbed our native cattle very much. After four to six weeks had elapsed, we found our mules and horses covered with these little pests, and they became so very thick on their flanks, etc., that we were obliged to clean them off.

From the 2,000 head of cattle that were taken off at Danville, carried out to Lafayette and pastured there, no trouble whatever has resulted.

My impression is that there has been much less trouble with the Abilene cattle than the southern cattle. It may be that, in some way or other, their being driven through the country clears them of the disease.

MR. STOCKDALE, of Ohio—I would like to ask, sir, if the cattle had any ticks in the spring?

MR. EARLE—No, sir; none at all.

DR. RAUCH, of Illinois—I would like to ask the gentleman if he knows from what counties in Texas his young man purchased those steers?

MR. EARLE—Well, sir, we got one little lot of sixty cattle at New Orleans. About 225 wintered there, and 60 head came in on a schooner from the gulf, which were put into this lot and brought up in the summer. Our young man said that he did it as an experiment, to see how the cattle would turn out; and they did very well.

DR. RAUCH, of Illinois—Am I to understand you, sir, that part of the cattle purchased in lower Texas were driven across the mouth of the Red river, and a part shipped to New Orleans?

MR. EARLE—Yes, sir, and were mixed on the farm afterward. The first lot we bought in New Orleans were wintered in Louisiana, except this little lot of sixty.

MR. MCCOY, of Kansas—Mr. President, in regard to the matter whether or not cattle coming by the way of Abilene communicate the disease, I feel somewhat interested. In June, 1867, I started west to find a place somewhere beyond the settlements—to some point where the cattle of the south-west, particularly Texas cattle, might be driven unmolested. My idea was to establish a station from which a Texas man with Texas cattle might stand at least an even chance of getting them to market undisturbed—a common

center, where the buyers, coming from all over the country, might meet them, and thus create a market, in case that free right was denied the first holders to bring through their own stock. I made this determination in June; having selected my location, sent out a competent man, and, about the 1st of July, returned myself. Even at that time, cattle had begun to gather about this center, and they continued to congregate from that time onward.

And, by the way, I will say here that I do not think the state of Texas is generally understood; but if you will only stop to think of it, you can but be impressed with the vastness of its area—being six times the size of this noble state—and its infinite stock-raising capabilities, producing, as it does, three and an eighth millions of cattle—one-eighth of all within the United States. So deeply were its people impressed with the importance of some such move as we then made, that, during our canvassing of the country, the invariable answer to the question, "what is your great want? what will contribute more than anything else to your well-being as a state and as individuals?" the answer invariably returned was, "only give us some outlet; some opportunity of getting to market such portion as we may desire to bring of the innumerable herds that are now roaming over our vast prairies, and are comparatively worthless for want of an outlet." I will state here, gentlemen, that at the close of the war, cattle were almost worthless in that section, on account of their untold numbers; and that this was the fact you will see at a glance, when I state to you that from a herd of 5,000 we bought 300 of as choice cattle as I ever saw for six dollars apiece; or rather, I would say that the average cost was about four dollars and a half apiece; while, at the same time, if those very cattle could have been lifted up, transported through the air, and set down in the Chicago market, they would quickly have sold for seventy-five.

Having this knowledge of the situation of matters, I selected that point with which you are already familiar, as the one best adapted for a depot at which these vast herds might congregate, be sold, and placed *en route* for market. I did this in the latter part of June, as I have already stated, and by the middle of August thirty-five thousand cattle had gathered around that common center, mingling freely with the native cattle all through the summer. On the 5th of September, we opened those yards and began shipping.

And right here I wish to say this regarding the Texas cattle plague: that notwithstanding there was this vast congregation of Texas cattle, mixed up promiscuously with the native cattle, not a single case of that disease occurred—not one.

A word in regard to the routes by which these Texas cattle in former times reached a market. They were sometimes shipped around to New Orleans and then came forward upon the Mississippi, but most of them were driven directly to the mouth of the Red river, and I beg leave to call your attention to the character of the country through which they in that case passed. They were all the way exposed to a broiling, almost a tropical sun, through a region covered, in a great measure, with the pitch-pine, from which the resinous substances fairly boiled under the influence of this intense heat; through a country covered with an almost worthless grass, so utterly miserable that no steer in good flesh would eat it at all, and which a poor steer would only brouse, rather than starve. Such was the character of a great portion of the country over which these cattle were obliged to pass.

At the river there is a vast swamp—or rather a great timber country, interspersed with innumerable swamps—where the cattle could not be kept waiting, and where it was absolutely necessary to push them forward by the first boat, at whatever price might be asked, when, of course, the motto of the steamboats was, the more cattle, the more dollars. Consequently, of course, the steamers were so much crowded that it would be impossible for a single animal to lie down during the whole trip, and so that there was no such thing as giving food or water to one of them, in a proper manner. I obtained part of these data of a gentleman entirely familiar with this subject, who assured me that on account of the way in which these boats were so densely packed, the cattle could not by any possibility change their position, but were obliged to stand for from six to eight long days—the only way in which food could be given them being, to throw it over them and let one eat from the back of another—the only water that they got being such as could be thrown over them by the hose.

It is not to be wondered at, that after being subjected to such treatment as this, they should be diseased on arriving at Cairo, and be capable of imparting disease to the devil himself, almost, I was going to say. I do not hesitate to say that any cattle in this

country, I don't care how healthy, after being treated in this manner, would become diseased beyond the possibility of recovery.

Respecting cattle that are driven from the west, our invariable experience has been, that when cattle have been wisely selected, driven rightly, handled as they should be, making daily only the proper number of miles, and stopping when they ought, and properly cared for as to food and drink, they have invariably arrived in good condition, healthy, sleek, and as a rule, there was no disease. I do not pretend to say that no cattle that came from that way, imparted the disease.

It is a fact, that when those thirty-five or forty thousand cattle were at our station in July and August—when there was so severe a drouth through the country that corn turned brown, as after a frost, and when all of our water was well nigh dried up—when it was very hard, indeed, to get proper feed and still harder to provide drink—some of them died; but I assert it as a fact, and I believe that gentlemen will verify my statement when I say, that when the disease did appear in cattle coming that way, it was in a mild form, and in many cases not fatal.

As to the causes of the Texas fever, I have long been of the opinion, and that opinion based on thought, reason, observation and inquiry, that it can be traced largely to the barbarous manner in which these Texas cattle have been handled; that in and of themselves, they contained no disease, for in their native state, they are as healthy as cattle any where. In Texas, and also in the country about Abilene, the drovers, a venturesome, wild, risky class of men, collect about them a set of younger men, as much wilder than they are as they are wilder than common men, whom they would send out to gather and drive in, and start to market, their cattle. On inquiring of them as to how they got along in collecting them, a common answer would be, "oh, we give them hell!" "What kind of drive do you make?" and they will tell you ninety miles in two days.

I tell you, gentlemen, that these cattle are, of all cattle in the world, the most tenacious of life, or the last one would be killed before getting here. Native cattle would not bear half the abuse—it would kill them stone dead.

I call upon every one who has had an opportunity of examining diseased cattle through Illinois, to testify if the larger part that have died in Illinois have not been lost on the line of the Illinois

Central. And, as to the disease being almost certainly fatal, I was about to assert that scarce two hundred cattle have died in Illinois as the result of bringing animals from the west. I don't know as I would be quite warranted in making that statement, but I have watched the matter closely and I do know this to be true: that wherever a man has brought through a drove that has been carefully selected, well driven and cared for, that herd will tell its own story upon arrival; and that, when you find cattle looking poor, rough, running off when you walk towards them, and with that peculiar air of wildness about them, you may be assured, beyond all possibility of mistake, that they have been promiscuously collected, badly handled and rushed forward to market by a man who esteems the best hand to be the one who will drive them the longest and whip them the most in a day.

As soon as the weather turned cold the cattle stopped dying.

The President—Allow me to interrupt you, sir, to inquire if both heifers and cows are driven up, habitually?

Mr. McCoy—Yes, sir, they drive everything, from a sucking-calf to a fifteen year old steer.

The President—What do they do with the female cattle?

Mr. McCoy—I suppose you have been eating some of them in this town.

The President—I asked, because I never have seen one of them.

Mr. McCoy—I was going on to say that the cattle, when they arrive in May and June, are not fat enough to go to market. During this last spring especially, it has been the case, that a large percentage of four-year-olds, or older, have been bought by Indiana men, and sent forward here for pasture. And I will say, by the way, that they were bought instead of higher priced cattle, for the purpose of making money on them, and I leave it to every one who has handled them, if money has not been made—I say that it has, and largely, too.

The President—I don't exactly yet understand, Mr. McCoy, what becomes of the cows.

Mr. McCoy—I was about to say, sir, that they were held there until they got fat enough for beef and then they were shipped to market, many of them being bought by residents of Kansas, Nebraska, Montana, Colorado, Idaho, and some going to California, even.

And in that connection I will say, that there are very few in Texas who spay their heifers, but they are very few indeed, for it is a little too much work for the southwestern man. Their cattle are so comparatively worthless for want of a market and an outlet, and so many difficulties have been thrown in their way, that the raising of cattle in Texas has been very much discouraged thereby. The dealers are so indifferent that I never yet have seen a man in Abilene who could tell, within five hundred, how many cattle he had, while I have often seen men who didn't know within ten thousand—there are so many of them and they are so nearly worthless that no particular reckoning is kept of them. Cattle are recognized by the brand. The laws of Texas require cattle to be branded when a year old (and not until then, as I understand it), and if those cattle are found one mile or a thousand miles away, the man whose brand they bear is considered authorized to take them; while on the prairie, cattle seemed to have no value at all, but to acquire it the moment that they arrived at our station; and it was a case of almost daily occurrence for a man, seeing fifteen or twenty of his cattle in another's herd, to "go for them," drive them out and take them off.

Mr. Christie, of Canada—Mr. President, I do not wish the gentleman from Kansas (Mr. McCoy) to suppose that anybody was speaking of him or his establishment with the least intention of saying anything derogatory. I am quite aware of the great exertions made by himself and his partners, which are very deserving of praise—they are so—I feel that. Besides that, I am quite willing to admit what I think is beyond contradiction, that the cattle arriving by way of Abilene, are in much better condition and are treated much better than cattle coming by the river.

I will not have him labor under the impression that I intended any reference to himself personally, or to his cattle. I spoke in order to counteract the impression that I feared might be left on the minds of some, at least, to-wit: that cattle coming from the south alone, were those which contaminated others.

Mr. Rauch, of Illinois—I move, Mr. President, that this convention do now adjourn to ten o'clock to-morrow morning, Wednesday Dec. 2d.

The motion prevailed.

SECOND DAY—MORNING SESSION.

The convention met, pursuant to adjournment.

THE PRESIDENT—If any gentlemen have arrived since yesterday who have not reported themselves, as delegates, we shall be glad to have them forward their names to the secretary, and to affiliate with them.

MR. HAMILTON, of Pennsylvania—Mr. President, I am directed by the Pennsylvania delegation to present the credentials of the following representatives from that State:

E. C. Hume, A. Boyd Hamilton, Dr. Hiram Corson.

DR. JOHNS, of Illinois—Mr. President, I beg leave to lay on the secretary's desk the credentials of Dr. N. N. S. Townsend, of Iowa.

MR. REYNOLDS, of Illinois—I move, Mr President, that the gentlemen just named be admitted as members of this convention, without going through the formality of having their credentials passed upon.

The motion prevailed.

MR. SMITH, of Missouri—Mr. President, I believe I have some information on the subject of the Texas cattle fever, upon points not yet presented to the convention; but before presenting them I would like to say a few words relative to some matters that have already come before the convention.

1st. In regard to the enterprise at Abilene, it deserves high approbation. When considered simply as a financial speculation, I do not think that the go-aheadativeness and sagacity which conceived and carried it forward, can be too highly estimated; but when the gentleman asks our sympathy for men who have grown rich by doing nothing themselves but just lying back and allowing their herds to accumulate, I think it is very much like appealing to our feelings in behalf of the capitalists of Wall street, who, in the financial turn of the country, find themselves overburdened with greenbacks. If those capitalists chose to send out their money into the country to provide us with means wherewith to work, they certainly would be deserving of great credit; but if, with those greenbacks, they sent out a sentence of death to us, or imposed conditions which would in the end ruin every man who took them, it does not seem to me that they would merit anything

at all. This illustration, as I conceive, applies exactly to this Abilene enterprise. It is not disputed that these Texas cattle, when driven through the country, will impart disease, and I have no doubt that if we should take two men, one of whom brings cattle to us by way of the Mississippi, and the other by way of Abilene, they would mutually condemn each other. I do not think, myself, that simply because Texas cattle reach us through the one or the other of those channels, they should therefore be allowed to, at all times, come into this country. Besides that, so far as one or the other of these routes being the principal one, more cattle have probably passed through the western counties of Missouri and the eastern counties of Kansas, than through any other sections—and what renders the matter worse there is that the driving is not confined to any particular tracts; and notwithstanding they are brought through in a more humane manner than through any other channel, they disseminate the disease more widely than any other herds. The cattle started from the Indian Nation and driven up through these counties, feeding on the rich grasses that grow so luxuriantly there, have nevertheless spread this pest so extensively through the country, that the people are desperate and are determined that no more cattle shall find a market by passing through that section of the country.

It seems to me that all these theories concerning the disease are premature, and when a committee was proposed who should report regarding the propagation of this disease, etc., I could not think of any time less than three years, in which they could possibly do so. A few such facts as were brought before us yesterday by the gentleman from New York (Mr. Gould), are worth all the theories entertained by the largest cattle growers that ever existed in the United States.

So much has been said and written upon this subject, that it would seem as if little which was new could be offered; but so long as there is doubt and discussion upon the matter, we cannot dispense with any facts which may throw light upon it.

Theories can only be constructed upon a foundation of facts, and until we have more of these it is hardly safe to undertake to build up the latter. It is even denied by some that there is any cause for action; that Texas fever is a mere chimera, begotten in jealousy, and hatched in the interest of farmers and cattle dealers of the border states, who wish to stop the trade in Texas cattle,

in order to remove competition in business. I know that such was the feeling among many, and I confess to a participation in it before I went to live in the district which has suffered most by the disease; but the experience of last summer ought to convince the most skeptical that it is a reality, and that the damages it inflicts are worthy of national consideration.

So long as these damages were confined to the remote borders of Missouri and Kansas, very little sympathy was elicited, and it was with some difficulty that the legislatures of the states most interested could be induced to pass laws upon the subject; and even when they did, they were so imperfect that the evil was only partially remedied. But the experience of last summer was too severe, and the lesson it taught too plain to be longer neglected.

I have here the report of Dr. Badger, published in the Missouri Agricultural Report of 1866. Before proceeding to read it, however, I would like to say that Dr. Badger has lived in Vernon county for a great many years; that he is an intelligent man, and one every way competent to observe and explain himself understandingly. And I felt, too, as if I ought to say this in relation to him, because very many things are observed by men, who, however competent in other places, are, like myself, not competent to investigate the pathology of the disease.

Before, however, quoting his remarks, I will read that portion of the report immediately preceding them:

"TEXAS FEVER AMONG CATTLE.

"Another pest which has made its appearance in the state within the past season is the 'Texas fever,' 'Spanish fever,' or "Texas murrain,' as it is variously known. This is not a new pest in the state, as the statutes show. There was, however, almost an entire immunity from the disease during the war, when the driving in of Texas cattle was entirely suspended, with the exception, perhaps, of a very few isolated cases, which gave rise to the only cases occurring during the war.

"The subject is an interesting one, and one which will demand legislation. The existing law in the case seems to be entirely inadequate for protection, and the people have frequently been obliged to resort to other means.

"Mr. William Montgomery, of Stockton, Missouri, writes: We are at a loss as to how the disease is communicated, as there is no

apparent disease among the Texas cattle; but wherever they are herding any length of time, our cattle take some disease peculiar to dry murrain, and the actions of the animal, with the disease, are similar to a horse with the botts or colic. They seem to suffer severely with inward fever. When dissected, they appear to be dry and scorched with inward fever. Nearly all that take the disease die, unless treated immediately. Our remedy is, to drench them with lard, or slugs of fat bacon. It does not look reasonable that the Texas cattle could communicate the disease themselves; but the general opinion is that the disease is communicated by the breath.

"As to an amendment of the laws, we think it would be well to have them so amended as to prohibit Texas cattle from passing through the state, except during the cool season of the year, as we have noticed no disease similar to Texas or Spanish fever, except during warm weather—mostly contracted near ranches and watering places."

Another gentleman of southwest Missouri, writes as follows: "I have lost very heavily this season by the 'Texas fever,' and although it is very strange to me how an animal that is healthy itself can impart so dangerous a disease to other healthy cattle, I am nevertheless satisfied that it can be done, as I have lost about one hundred and fifty head by the disease. They show the first symptoms by standing perfectly still in the position that they take to hold back, head down, fore feet thrust a little forward, ears dropped down, and are neither hungry nor thirsty. Their bowels become very costive; in fact it seems as if their intestines became entirely dry, and unless an operation can be obtained, they die. Our most successful mode of treatment was to make them swallow a piece of fat meat (bacon), and force another one up their posterior (rectum) with the arm, as large as admissable, and as far as possible. We saved about sixty after we adopted this mode of treatment; but the hair came off in spots from one to five inches in diameter. I doubt whether it can be cured in every case. I have heard a great many theories about it; but I understand you want facts, and I have written them.

"There is another fact that cannot be gainsaid: that is, since 1861 there has not been a single case of Texas fever in southwest Missouri, neither has there been any Texas cattle. Until the past spring and summer we have had Texas cattle and Texas fever. I

have been dealing in cattle all the time since 1861, and in the time did not lose a brute until the past summer; so I say it is the southern cattle, and they ought not to be allowed to enter the state from the 15th of April to the 1st of October. Kansas learned this, and has legislated accordingly."

Mr. Huron Burt, of Williamsburg, Calloway county, says: "We have had some experience with the disease on the Nine-Mile prairie. Last spring, early in April, a lot of oxen passed through our county, on their way west, for some overland freighters, that had been shipped from New Orleans to St. Louis. The grass was just starting forth, and the cattle were occasionally stopped to bite at it. Wherever they grazed the virus of the disease was left, and all cattle that fed on the same ground on which the Texas oxen grazed, were afflicted with the disease—nine-tenths of all the cattle affected, dying.

"The disease was communicated for several months, in fact, during the whole season, until the unusually heavy rains in September, which seemed to have washed away the seeds of the disease that had been so fatally implanted all along their route. It was necessary for an animal to feed on the self-same ground to contract the disease. Those feeding up to the very verge of the poisoned ground, with only a fence intervening, were unharmed. And I am further informed that the disease is only communicable from Texas cattle. Stock, feeding after our home cattle that are diseased, escape unaffected.

"This has proven to be the most fatal cattle disease, and the most destructive to the stock growing interests, ever known in Calloway. Captain Hobson lost all his cattle, some fifteen or twenty, save one. His son lost all of his. Mr. Everhart lost several; among the number, a very fine bull, which is a loss, indeed —animals of this character being quite scarce in our section. Mr. Joseph Grant lost some valuable cattle, besides others that do not occur to me at this moment. If the intervention of law was ever required in any case for the protection of stock growers, it is in this instance; and I am heartily glad to see the movements made in this direction. Four and a half or five months should be the extreme limit allowed for passing this kind of stock through our state, and I am not sure but a shorter limit would be justifiable; say from November 15th to March 15th."

The following communication from Dr. Albert Badger, of Vernon county, Mo., gives the most full account of the disease that we have been able to obtain:

THE SPANISH, OR TEXAS FEVER.

"The Spanish or Texas fever is well known to the older residents of this county.

"This disease was first recognized as having been propagated by cattle driven from Texas some twelve or thirteen years ago; the disease having been in the county some two seasons previous to its having been traced to the Texas cattle.

"From the first breaking out of this fever, it was found to be confined to the large roads or highways running through the county from south to north, and finally was centered on the Texas cattle, I believe, in the year 1853, by its being confined to one highway through the country, over which these cattle passed in that year. On this road the disease was quite fatal, killing about fifty per cent. of all the cattle on the road; and persons living near the water courses over which the road crossed, lost as high as ninety per cent. Captain Freeman Barrows, and Peter Colley, the one living at the ford of the Osage river, the other near by, lost the latter per cent.; one of them owning about one hundred head, while the former had considerably above that number. Mr. Collins, living at the ford of Clear creek, south of the above, lost an equal proportion.

"The disease being in no other part of the county that year, satisfied the people, on this road at least, that they had found the true origin, as it had been among the cattle in the county for two summers past. In a season or two after, almost every settler of the county was convinced that the Texas cattle, in some way, communicated this fever to our stock, although a few persons living secluded from the great highways were unbelievers, and still remain so. In fact, the way this disease is propagated, the obscurity surrounding it for want of a defined cause, together with the different conflicting opinions of almost every citizen familiar with it, gives them, at least, a reasonable excuse for believing no one's opinion. Two things only—the symptoms of the fever and its fatality—are agreed to by every one; the latter being much greater in a warm, dry summer than in a cold wet one; the disease

always ceasing when the frosts and freezes have killed the vegetation.

"The first symptoms of the fever discoverable, several days before there is any appearance of the sickness, is a dry cough, which is noticeable by careful observers. In a few days after this, the nose becomes dry, and the ears slightly drooping, when more flies will be found to collect on this than the other cattle. At this stage, the breath will be found to have lost its sweetness, so peculiar to grazing cattle, and assumed the sickening, feverish smell, generally, if not always, found in Texas cattle, which I can best describe by comparing it to the smell of our slaughter houses, or constantly crowded stock yards in cities. From this condition, in one or two days the fever gains its highest stage, and is found to have disseminated itself over the whole body, the heat being very great, and the arteries of the neck are seen to beat in short heavy throbs, and the ears very much lopped; the hinder parts reel in walking, the animal getting up or lying down with difficulty; the breath and exhalations are very disagreeable; the end of the tail is usually hollow for two or three inches; the pith in the horns has commenced to decay, if not already decayed; the animal refusing to notice the herd, remaining stupid, if not disturbed, neither seeking food or water. Some, in this stage, will pass water mixed with blood, and dung naturally; others will pass water of a natural color and not dung at all, or but very little, and that in a dryish lump. In another type of the disease, which will occur perhaps in every eighth or tenth case, after being taken the same way, and having the same symptoms as those described, even to the hollow horns and tails—the animal does not get weak, sluggish or stupid, but is always to be found on its feet, in a watchful attitude, with head turning to any noise, which, if close by, it rushes toward, even through fences or against trees; the eyes being of a green cast, very glaring and wild; those of the first type have a dead, sleepy and glazed appearance. Both these classes die, as I have described them, without any change, except their hair deadens before death, and has the appearance of that on a dry hide.

"The drove mentioned as having passed through the country in 1853, was owned by Mr. Richard Burriss, of Spring river. They were driven from Texas the fall previous, and wintered about fifty miles south of here, near Sarcoxie. In the first days of June,

Mr. Burriss came into this county with his cattle, apparently healthy, in good order, and no lame ones in the drove—numbering about 450 head. He made a slow passage through the county, grazing in the best grasses near the road, unmolested, as no one knew at this time that this species of cattle propagated a disease to ours. In the first days of July the fever broke out on the road traveled by this drove, lasting until the frost put a stop to it, with the fatality previously mentioned. As the disease, this year, was in no other locality, except where these cattle were driven and grazed, the citizens, after carefully tracing their route through the county in all their wanderings, came to the conclusion, for the first time, that this fever was engendered from the Texas cattle. This was verified most fully in the next year; and up to the outbreak of the war, hundreds of circumstances have occurred in proof that they were not mistaken.

"No Texas cattle, until this year, have been passed into or through this county since the year 1860, except two yoke of oxen in the fall of 1865, worked here by Mrs. Box; neither has there been a single case of fever during this period, or any fatality among our cattle. Mrs. Box's were, so far as could be seen, healthy and not lame. The neighbors whose cattle came in contact with these oxen were Mrs. Smalley, Mr. Cothran and Mr. Packard, each having the Spanish fever among their stock, losing some, notwithstanding the lateness of the season.

"About three thousand head of Texas cattle passed through this county in the month of June of this year, and a portion of them reached six or eight miles into the adjoining county of Bates before being turned back by the citizens of that county. They returned on the same road previously traveled, making no delay in their passage either way more than was necessary. The disease did not break out for some six weeks or two months after the passage of the droves, many more recovering from it than usual —and about forty per cent. dying—extending into Bates county to the point where they were turned back. It proved more fatal in the crossing of water courses, killing about seventy per cent.

In 1858, my stock were exposed to this fever by coming in contact with a drove of Texas cattle. The fever was very bad among them, one or two dying every day through the month of August; they were in daily contact with Mr. Millender's stock, who kept a herder, not suffering them to reach the grounds that

had been used by the Texas droves, yet he had not a single case of fever. When spoken to about keeping my stock from coming in contact with his, he told me there was no danger of our own cattle diseasing one another. I have since watched many such exposures, and in no case has the fever been propagated. The farmers have each an opinion as to how the disease was propagated to their cattle, some thinking it is through the lame ones, a few of which will be found in nearly every drove coming from Texas. Their feet become worn out and sore from long travel, matter forms between the hoofs and is left on the ground and in the water through which they pass, and it is contended this inoculates our cattle by being taken into the stomach or otherwise. Others think it is done by the excrements left by those that are lame, or the diseased ones; while some think it is through the slobber or froth which is left on the grass. On one thing they agree—that the fever is propagated in some way, raging until the cold weather puts a stop to it, no remedy appearing to have any effect. From the few cases mentioned, which are selected from many of like nature, I have been led to believe, first, that the disease is conveyed to our cattle by those from Texas; second, that the feeding of a large herd one winter in this climate does not stop the spread of the infection from them in the next season; third, that Texas cattle, in apparent good health, give disease to ours; fourth, that the disease is not contagious from our own cattle to each other; fifth, that killing frosts will stop the disease; sixth, that no remedy has been found to cure this fever.

"In a very close observation of this disease among my own and neighbors' stock for the last thirteen years, I have generally found, on opening those that had died, but very little blood, and the following results: those that passed water mixed with blood, the kidneys and surrounding parts were entirely decayed, the other parts of the body sound; those that did not dung at all or but very little, with manifolds perfectly dry and partly decayed, while the large stomach would be more or less mortified—other parts healthy; those that appeared to dung and pass water naturally with a liver more or less decayed, the gall always swelled to its greatest tension—other parts healthy; those that were ever on their feet in a watchful attitude, the brain was found more or less decayed. This leads me to believe the disease to be in the blood, which finally becomes congestive, destroying the parts in a few hours

after it becomes seated, and no doubt in many cases could be cured if we knew exactly when and where it had located itself—blood letting not being sufficient, of itself, to check the inflammation. The hollow horn and tail, no doubt, is caused by the fever destroying the blood in the extremities before it does in the vessels, which it does, in a great measure, before death.

"This county has suffered very severely with this disease for a number of years, losing in the year 1858, cattle estimated to the value of over one hundred thousand dollars. The present law is very defective for keeping out the disease. First, it only precludes the sick ones from a passage through the country, and few men, under oath, can say that, because a steer has an unhealthy smell, that he is sick, when apparently he is in as good health as their own cattle. Secondly, in order to separate the lame or sick ones, if any, the drovers, under our present law, are required to impound them, in order that the selection may be made. How is it possible to imponnd from ten to seventy thousand head of cattle when the owner has not a single pound, and no means of getting one? If a farm was bought for this purpose, the country for miles around would be overrun and eat out by these cattle waiting their turns for examination, thereby destroying every head of stock in that and the immediate locality; in fact, why select the sick ones when there is equal danger in those that are apparently well?

"One thing is certain, this part of Missouri, one of the best counties in the state for raising stock, must quit the business, or our laws must protect us. This can be done by so changing them as to preclude this species of stock entirely, or let this state buy a right of way from some point on the railroad to the northern border of Arkansas or the Indian Territory, running as much as possible through our prairies. This will not interfere with citizens. Tax each head of stock, driven over this road, one or two dollars until the road is paid for; the drovers will readily pay this sum, which, no doubt, will pay for it in two or three years. I was told this year that there was seventy thousand head of these cattle between this county and Neosho, a distance of not more than one hundred miles, and that many more would be driven if they succeeded in getting through this. By this a market would be furnished Texas for the surplus stock, and would also be the gainer. This would seem to me a way of excluding them; and, further, this great

highway, honestly conducted, would in a short time be a great source of revenue to the state. The drovers, this winter, on the meeting of the legislature, will spare neither time nor money to abolish the present laws, or getting relief in some other way. I propose for their consideration this road—without it they must give up their occupations or we must ours.'

"Respectfully,

"ALBERT BADGER.

"NEVADA CITY, VERNON CO., MO."

The report goes on to say:

"Reports have reached us of the ravages of Texas fever from Kansas, Tennessee, Kentucky and Illinois. The losses from it have been heavy; in some instances very choice and valuable stock has been lost.

"Western states have been severely censured in some quarters for passing laws to prevent the introduction of this disease, attributing to us selfish motives, namely, the prevention of the competition of southern cattle in our markets. It will be seen, by reference to the opinions already given of farmers of southwest Missouri, a locality that has suffered, probably, more than any other, that no such selfish motive is apparent. They propose that the Texas cattle shall be prevented from being driven into the state during the warm season when the fever is so readily communicated, but to be allowed unrestricted passage during the cold weather, when the disease seems not be readily communicated. Dr. Badger proposes that the state shall purchase a right of way from the southern line of the state to the Pacific Railroad, on which Texas cattle may be driven at all times.

As before remarked, the subject has become one of urgent importance, and the legislature will be called upon to enact laws on the premises which will protect the interest of the state and the welfare of its inhabitants. A law entirely prohibitory, we think will be the only effectual method of keeping the disease out of the state. If southern cattle are allowed to be driven into or through the state at all it will be almost impossible to prevent more or less of our stock from the pestilence which they carry. Again, we think they should be kept out of our markets as a wise sanitary measure. It can scarcely be possible, certainly is not probable, that cattle carrying an infection of so virulent a char

ter can constitute wholesome human food. Who would, knowingly, eat the beef of cattle with such a pestiferous breath as these Texas cattle seem to have? It can be no favor to the consumers of beef to have that article cheapened in the market by the introduction of an article of such very doubtful, not to say injurious character. We should keep out the Texas cattle on the same principle that we would the small pox or the cholera. They are pestilential. Who could complain or who would suffer from such a law? Chiefly, it would be the drovers and speculators in this stock who care more for filling their own pockets than for the losses of others, or the health of the community.

Commissioners have been appointed, and a good deal of individual effort expended upon the subject; but in most cases, the inquiry has been in regard to the pathology of the disease, rather than the best means of its prevention. To show that legislative action is necessary, and that it should be uniform in all the border states, I have endeavored to obtain information from those most interested, viz; the farmers along the borders. In this I have been only partially successful; but as I know that the answers to my inquiries are all to the same effect, and would be if I should extend them ever so widely, I offer these I have as a sample of what might be expected by the most extensive correspondence:

MOUNT VERNON, MO., *November* 12, 1868.

PROF. SPENCER SMITH.

DEAR SIR:—Yours of the fifth instant, came duly to hand; but, for the reason that I was very busy in court, I postponed writing until now. I have been living for thirteen years, or for the greater portion of that time, near the great thoroughfare for driving southern cattle to St. Louis, and during that time, up to the breaking out of the war, we had more or less of it every year, but the most we ever suffered was in 1858. I find, from conversing with others, and from my own experience, that it is much worse of warm, dry summers. Much depends, however, on the way or manner in which they are driven. Some drovers seldom have cattle infected with the disease; whilst others always have diseased cattle in their herds. In the course of my profession I have had several very good opportunities, testing this matter. I ave heard over one hundred experienced drovers, dealers and farmers, etc., estify pro and con as to whether it was contageous or not, and also, whether ur cattle became infected with it from southern cattle being driven through e country. But one of the best tests I have known, fell under my observa- n during the war. Previous to the war, the southern cattle were driven ough the border counties of this State bordering on Kansas, at least, in

the south-west border counties; and we suffered from it, more or less, every year they came through. During the war, no southern cattle were driven through there, and not an instance have I ever heard where one cow died with that disease in that region during that time. But when we got possession of Forts Smith and Gibson, then again the Indian cattle were driven up where 'tis known as the military road, in Kansas, and all along that route they suffered severely from the disease. When in Missouri, twenty miles or even ten miles distant, no such thing occurred. The same could be truthfully said of every other part of Kansas, during that time. Now, again the cattle are brought through these border counties; and the result has been that almost one-half of the cattle in Newton, Jasper, Barton, Vernon and Dade counties, died from the disease this season, and the country where they traveled alone suffered. I am well satisfied, from all that I have seen and learned, that our cattle became infected by grazing where these cattle have grazed. There is one thing held out by the advocates of the traffic which is untrue, that is, that these southern cattle are themselves not diseased. I have handled some and seen many sicken and die with it, yet I believe they are not as subject to it as our native cattle; but they often times have it in their own country, as I have heard several men of experience testify. As to just where the seat of the disease is, I cannot say; but I believe it is in the foot. Old drovers have told me that cattle driven slowly and rested often, would never distemper other cattle, and I have found this to be true. Another thing is, that heavy cattle are almost certain to be diseased with it; while young stock cattle seldom have it if driven prudently.

On examination of cattle diseased, you will find by opening the hoof, that their feet are sore and continually throwing off pus. Some think this disease of the foot is caused by the "*borer*"—a fly that is very numerous in Texas, and in some of the Indian countries—which bores in the heels and feet of animals and sometimes ruins them.

I think the matter well settled, that the driving of southern cattle through our country is the cause of the disease; but I must confess that I have been at a loss to reason about it, as I would about almost any other subject.

Hoping your communication may result in much good,

I am your obedient servant,

NATHAN BRAY.

FORT SCOTT, *November* 13, 18[illegible]

HON. SPENCER SMITH, St. Louis, Mo.

DEAR SIR:—Your favor of the fourth instant is at hand, and contents noted. In reply, would say, that I have resided at this post since 1843; before Texas cattle became a trade or traffic. At the Missouri river points north of Fort Scott, when this trade opened, our cattle were all very healthy; but soon found a change in the health of our cattle. This trade lasted several years, say up to the commencement of the war. Then, all trade seemed

close in Texas cattle. This trade ceased until the war was closed. This trade again opened and our cattle became again unhealthy, at this time, if not before.

Our people became excited against this trade. Our people, wherever Texas cattle passed, lost their cattle. The excitement was such, it went into the legislature of Kansas, and laws were passed justifying the acts of the people in stampeding and driving the cattle back over the line or road they had come into the settlements. During all these number of years, before and since the war, the disease that Texas cattle communicated to our cattle, many hundreds and thousands of our stock have died. Difference of opinion, all this time, was among our people, and is to this day; but I have dealt in cattle, some, all this time, and have lost a good number by this disease, as I then and now believe. I watched the cattle we owned, along the road where the Texas cattle were driven, and those of us who had cattle feeding on these highways, universally lost a portion or all those cattle. One fall, I had upwards of 100 head of beef cattle, designed for the St. Louis market. These cattle were on the range, each side of the road these Texas cattle were drove. I did not disturb my cattle, and let them run. The disease was bad among our cattle that season. I lost quite a number of them from the disease they leave on the grass, from the saliva from their mouths; also when the waters are stagnant or not running. Many experiments have been resorted to, but the most of them failed. On one occasion, we sawed off the horns of some oxen that were very bad off, and matter rushed from the horns after they were sawed off; but very few have ever been saved.

Our cattle are tolerably healthy now; yet, there is some little disease here, and these Texas cattle are occasionally run through our country by night. The laws of Missouri and Kansas are now pretty severe. We are not much troubled. The disease is worse, I think, in dry weather. Much more could be said, and that against Texas cattle, for I have watched it from its commencement.

Very respectfully, yours,

H. T. WILSON.

With more time, I could have accumulated a large amount of evidence (it must be remembered that daily mails are not yet established in the remote districts of Missouri and Kansas) to the same effect, viz: that the passage of a drove of Texas cattle, through a district of country during the summer months, is sufficient to spread disease among our cattle which pass over the same ground within several days after the Texas cattle. The propagation of the disease does not require contact, or inhabiting the same pasture or enclosure for any length of time! but the disease breaks out among our native cattle who have the misfortune

to pass over the same ground, or drink from the same ponds used by Texas cattle. I know that it has been stated that "continuous contact, or grazing after them (Texas cattle) is necessary to produce the disease," but I think this can be abundantly disproved, even by members of this convention, from their own personal experience.

How the disease is communicated from these droves to our cattle, I leave to the imaginations of the theory makers.

We have not yet sufficient facts in the case to justify a certain conclusion. We must go on collecting facts for some time yet, and perhaps we shall finally be able to ascertain the true seat of the disease, and the nature of the infection.

To many, it seems preposterous to suppose that healthy Texas cattle can impart a disease to ours which they have not themselves, and that our cattle do not become the medium of conveying this disease to others. It is certainly somewhat strange, but that it is nevertheless possible, I am able to show, through the aid of Dr. Weslizenus, of St. Louis, who has kindly furnished me the following extracts from a German work on pathology—"Pathological Fragments, by Dr. C. W. Stark, Weimar, 1824."

In the ninth chapter, he speaks of infection from healthy persons, and mentions the following facts, for the correctness of which he says he can answer, because he has seen part of them himself, and others have been communicated to him from the highest official authorities of the states concerned.

First. In the year 1812, thirteen Russian prisoners of war, in whom no trace of disease could be found, marched through Prussia and Siberia, and left everywhere at their stopping a malignant, contagious, typhus fever, without being, themselves, even later affected by it.

Second. From ten to fifteen Russians themselves stopped over night, in Zullichal, in a very small room, crowded together with the landlord and his family. The latter immediately afterward were attacked by a very malignant typhus fever, of which they all died, and which also spread to the neighboring houses. The Russians were traced for many miles, and some weeks after were found perfectly healthy.

Third. Bands of Austrian prisoners, consisting mostly of Poles and Hungarians, left in Franconia, in 1812, thirteen *malignant* contagious diseases behind them.

Fourth. In Greifswald, prisoners of war, consisting of different nations, Germans, Italians, Danes and Frenchmen, confined to a narrow room, badly fed and very filthy, gave the contagious typhus fever to nearly all the inhabitants with whom they came in contact, although they, themselves, did not suffer from the disease.

Fifth. When the remnants of the French army—returning from Russia, bringing with them crowds of sick—marched through Berlin, no disease was spread. But when, in 1813, the corps of Wellzenstein, consisting mostly of Cossacks, Tschergises and Baschkirs, came to Berlin, an epidemic typhus fever broke out.

Sixth. A similar phenomenon was observed the same year in cattle. Droves of Podelian cattle, which, after strict examination and quarantine, had been permitted to enter the Prussian states as sound cattle, spread in their entire march through Prussia, Denmark and Mecklenburg, up to the Baltic, the *Vishseuche* (typhus fever of cattle), although not a single animal of the whole drove sickened on the way, but arrived in perfect health in Stratsund, and were slaughtered there as healthy cattle.

In similar manner, the typhus of cattle was created in 1814 and 815, by the numerous droves of cattle following the Austrian rmies, and belonging to foreign races.

This singular mode of creating and transferring disease from ealthy individuals, occurs mostly when the heterogenous masses f different nations or races come in contact, and might be called ationalizing disease, a process analogous to acclimatization.

Here, are evidently the same phenomena which exist in Texas ver, and which were observed long before this disease was own; unless it be that the typhus here spoken of was the same. s to the various opinions about ticks, disease in the hoof, contaon in the breath, etc., they may be all true or false. We have t sufficient evidence to substantiate or disprove them. But that r cattle die from some disease emanating from the droves of xas cattle—which are either driven here, or transported in cars is undoubtedly true; and that this happens only during the mmer months is also true.

A general law, therefore, which would operate alike in all the tes, and be just to all parties concerned, seems absolutely manded.

I beg pardon, Mr. President and gentlemen of the convention, for detaining you so long. I should not have done so had I not felt this matter to be one in which you are all as much interested as I am myself.

Mr. Gould, of New York—Mr. President, I am instructed by the committee appointed to draft a series of propositions, which may be enacted into laws, to report that it met at a very early hour this morning; has been in continuous session ever since, and is satisfied that it is entirely impossible to comply with the strict letter of the order of the convention.

I have the honor to report that it has arrived at certain general principles and conclusions, which it has directed sub-committees to report and present to it at once.

I am further directed to state, that it will, in all probability, be able to report this afternoon.

The report was accepted.

Dr. Johns, of Illinois—Mr. President, I offer the following resolution—

Whereas, The disease under consideration is known by the various names of Spanish Fever, Texas Fever, Cattle Plague, Black Water of Texas, etc.; and,

Whereas, We believe that a name characteristic of the disease is desirable; therefore,

Resolved, That a committee be appointed, consisting of Snow, of Rhode Island; Thayer, of Massachusetts; McCall, of Maryland; Mills, of Michigan, and Clendennin, of Ohio, who shall report to this convention a name that shall become uniform, and by which it will be recognized hereafter by the members of this convention.

Leave was granted to add the names of Messrs. Morris, Corson and Morse to the above. The resolution then prevailed.

Dr. Clendennin, of Ohio—Mr. President, I should like to introduce a resolution somewhat to this effect: That this convention do directly, or through the officials of the several states here represented, recommend to congress the appointment of a commission, which shall be composed of such persons as shall be thought proper, for the purpose of fully investigating the causes, symptoms, and everything relating to this disease; with power to go to Texas and the Indian Nation, and whose duty it shall be to make a thorough investigation of the whole subject, and report to congress.

The President—You will please reduce the resolution writing, sir.

Dr. Clendennin—I will amend the suggestion that I have just made by moving that a committee of three or five, or as many as may be thought proper, be appointed to draw a resolution asking congress to take such action as it may deem proper.

Gen. Patrick, of New York—One word, Mr. President, before that is put. I would suggest whether we could not, without the machinery of a special commission and appropriation by congress, reach the same result as that sought to be accomplished by the gentleman.

You are all aware, undoubtedly, that whenever an appropriation is made by congress for any especial purpose, there is always a grab for the spoils; and no appropriation that ever I heard of remained unexhausted.

Again, the general-in-chief of the army, or the secretary of war—

Dr. Clendennin—I said nothing in reference to the army, sir, at all.

Gen. Patrick—I am perfectly well aware of that, sir; and therefore, I am about to speak of it now.

What I was about to say, Mr. President, is this: That the machinery is already on hand; and so to speak, owned by the government. The army contains, at every post, gentlemen well versed in all the sciences in which a commission to investigate this matter should be versed. If they do not happen to be stationed at the exact point where such a commission would pursue its labors, they could be very easily ordered there. All these things are under the control of the war department; and it does seem to me that this is the proper department for us to look to, in order that this subject may be thoroughly investigated, and a report presented at the earliest possible day.

Dr. Morse, of Missouri—As an amendment to the resolution, Mr. President, I would strike out the word "congress" and insert "war department."

The President—Reduce your amendment to writing, sir.

Mr. Hamilton, of Pennsylvania—Mr. President, I move to strike out the word "war department" and insert "commissioner of agriculture."

Dr. Clendennin, of Ohio—Mr. President, I merely desired, in offering that resolution, that a committee might be appointed who should petition congress to take some action in reference to this disease.

With reference to the matter being referred to the war department, I merely wish to state that I have some experience regarding frontier posts, from the officers at which the proposed commission might be organized. The highest ranking officer in command is perhaps a captain, but in many cases a lieutenant—the only medical officer at such a post being an assistant surgeon of some two or three years standing, who left college and went directly into the army, without then having had or having gained since, any experience worth mentioning, in conjunction with that which should be possessed by those to whom the consideration of this matter should be referred. It is but fair to presume that the other officers stationed at these posts are of about the same class. The value of the commission will depend upon the talent of which it is composed. I do not mean to say that there are not very intelligent and highly educated gentlemen in the army—every body knows that there are.

Dr. Morse, of Missouri—Mr. President, I believe, for one, that if this matter were confided to the war department, it would detail persons competent for the work. Here is another point that should be considered as a reason why the war department should have charge of this. A great deal of that Texan country is not by any means in a settled condition, and it strikes me that it would be rather difficult to find two or three men to go down there, unprotected as they would be to a very great extent; whereas, if the army takes the matter in hand it is already equipped for any emergency.

Dr. Clendennin, of Ohio—It seems to me, Mr. President, that if congress takes any action in the matter, it will appoint such persons as will be entirely competent. It seems to me that the people of Texas (in which state, as has already been remarked, harmony has not yet been quite restored) would gladly furnish to such a commission all the information in their power, and, of course, such commission would command and be able to obtain the protection of the military posts in that state. It seems to me perfectly proper that this matter should be presented to congress, and that it should designate who, or what department should act in the premises.

The President—The question is on the amendment of the gentleman from Missouri (Dr. Morse), striking out "congress" and inserting "war department." The amendment prevailed.

Mr. Stockdale, of Ohio—I hope, Mr. President, that the house will vote down the resolution. I believe we can get as good a report from this convention as from congress, as we have all the testimony here. I hope that the convention will, itself, appoint a committee to report in regard to all the matters within the scope of the resolution.

Prof. Chadbourne, of Wisconsin—I hope, Mr. President, that the resolution will not be voted down, for I am satisfied that a long series of observations, by men accustomed and trained to observe, must be first made before any action can be taken regarding this matter, with any degree of certainty. We must first secure the facts, and I do not believe that there are many medical men in our frontier posts, at all competent to secure the particular kind of facts which we must have before we can arrive at any kind of a safe conclusion with reference to this disease.

The President—The amendment of the gentleman from Missouri (Mr. Smith), striking out "war department" and inserting "commissioner of agriculture," is now in order.

Mr. Reynolds, of Illinois—I understand, Mr. President, that the department of agriculture is already doing this very thing—why then should we memorialize the commissioner of agriculture, at all.

Dr. Miles, of Michigan—Mr. President, I hope this amendment will not prevail. The circulars sent out by the department of agriculture, signed as they are by irresponsible or interested parties, will not enable us to come to any definite conclusion with regard to this disease. We want to know something accurately, something that can be relied upon, regarding its extent, the precise conditions under which it is developed and the means by which it can be controlled. I voted for the amendment inserting "war department" instead of "congress," simply for this reason, that I am satisfied it would be almost impossible to get the matter before congress in a shape that would produce any satisfactory result. There are plenty of men in the army fitted to make these investigations, and if they do not happen to be at the posts where these inquiries are to be made, the war department can order them there; or if there are men now at those posts not entirely capable, the war department will assign those who are. Besides, we shall have a report very much sooner, if conducted under its auspices, than we shall be able to obtain if the matter be intrusted

any where else. I am entirely satisfied that we should not get any report from a commission appointed by congress, in less than three or four years, while what we want is something right away.

The sending out of a commission from this body, seems to me cannot be undertaken, simply for the reason that the expenses of such a commission must be paid, and I am not aware of any method by which we can raise the funds in this body.

Gen. Patrick, of New York—Mr. President, my suggestion, for it was such, regarding the war department, will not militate against a commission finally.

What the gentleman from Ohio (Dr. Clendennin) and the gentleman from Wisconsin (Mr. Chadbourne) have said, is in a great measure true, and especially so since the war and the enlargement of the army.

At the present time many of the junior officers and of the medical staff have been but recently taken from civil life, in consequence of the exigencies of the services, and put forward of necessity. But go you back to those of higher rank—to the scientific corps of the army, to the old officers of the medical department, of the engineer, and topographical corps, and of the ordnance department, and you will not find their superiors in the sciences to which they have devoted themselves. The chief engineer of the army, to whom this matter would naturally be referred, is a man not only associated with all the scientific societies of this country, but whose name is widely known in Europe. He (in former times, at least, it would have been so), in consultation with what is termed the staff corps of the army, selects from the scientific corps those gentlemen who have made special attainment in the specialty of their respective professions. To each of these small commissions gentlemen from civil life are attached, as the botanist, the historiagrapher, etc.

The special reasons why I wish this matter referred to the war department, have been already partially covered—such as the difficulty of reaching these points, without the aid of the officers and troops of the army. It is true that any one, going out clothed with authority by congress, must, of necessity, be received. But, gentlemen, you are perfectly aware what a difference there would be in the reception of a commission composed of civilians and one composed of those already perfectly at home in these fields, to

whom that information would be most gladly afforded, which the people would be somewhat doubtful about furnishing to others.

A word, now, gentlemen, in regard to this commissioner of agriculture, for I have had some little experience with that gentleman. In regard to the facilities which the war department could place at our disposal, I happen to know a little something, for in times past I have had considerable experience regarding the formation of commissions like that which we now wish to send out.

But to go back a little. We had thought of such a commission as this, and I, as the chairman of our organization, wrote to one of the officers of the subsistence department, as an old associate of the gentleman in question, stating to him what we had already discovered, and suggesting that quietly and without going through any red-tape business, he could give us an order applying through the whole southwest, and such other places as we would be likely to visit, whereby medical officers at the different posts might, if competent, be detailed to accompany us; and, by the way, at many of the posts, were some of the old officers perfectly *au fait* in this business.

I also wrote to an officer, high in rank, in the medical department, saying to him in the same spirit: "I have written," so and so, "and you can work together in carrying out what will be in its results a great contribution to sanitary science generally."

Unfortunately, the first mentioned officer was absent on a tour of inspection through the west, which would consume several months. The subordinate, into whose hands it fell, not knowing much about such business, went, as a matter of course, to the commissioner of agriculture. That functionary responded substantially: "No, sir, no, sir, I have sent out Prof. Gamgee; he knows everything; he will make a report; don't interfere with this thing; I have got it now, and it belongs rightfully to the agricultural bureau."

What was the result? The commissioner of agriculture says it will be January before an appropriation can be made; nobody knows how long before the plates will come out, or what the report will be worth when it does appear—speaking with all respect of Prof. Gamgee.

Mr. Smith, of Missouri—I withdraw the amendment, Mr. President, that I proposed a little while ago, and offer the following as a substitute for the whole resolution, as amended:

Resolved, That this convention appoint a commission of three to investigate the causes and geographical distribution of the so-called Texas cattle fever, and that congress be memorialized to furnish the necessary means and power for carrying on this investigation.

MR. ———, of ——— —Mr. President, I move that this whole matter be laid over for the present.

The motion prevailed.

Whereupon the convention adjourned until 2:30 P. M.

—

AFTERNOON SESSION.

WEDNESDAY, Dec. 2, 1868.

THE PRESIDENT—The convention will come to order. It seems to be generally understood, gentlemen, that this afternoon we are to hear from Dr. Morris, who has been engaged for the last four or five months, as an officer of the board of health of New York, in most thoroughly investigating certain phases of the Texas cattle fever. Will that gentleman be kind enough to take his stand upon the platform, where he can be distinctly heard by all.

DR. MORRIS, of New York—Mr. President and gentlemen, I rise before you in the humble capacity of a sanitary officer of the metropolitan board of health of the metropolitan district of the state of New York, delegated by that body at the urgent request of the honorable the chairman of the commissioners upon cattle diseases of the state of New York, who have so cordially, kindly and efficiently co-operated with the metropolitan board of health in pursuing the scientific investigations, as directed by its officers, and the control of diseased meats brought into their markets.

Those investigations have not been pursued in any captious spirit, or from any interested motive, but as part of the duty pertaining to a scientific sanitary organization, combined to study, elucidate and apply to great sanitary laws which govern our well being as a nation.

The cattle yards at East Liberty, near Pittsburg, under the control of the Pennsylvania Central Railroad, the chief places where cattle are shipped on the several western roads, and especially the experience at Chicago and at St. Louis, were interrogated immediately after the disease came under observation at New

York. The mayor and the head inspectors at Pittsburg, Dr. John H. Rauch, the sanitary superintendent at Chicago, Dr. Neil, the health officer at Dayton, Ohio, and Prof. Gamgee, at once responded to requests for information, and so did a great number of gentlemen connected with the local government of towns to which the board sent inquiries. Information was sought from nearly two hundred separate sources. The general result of all this inquiry appears to have been simply this: First, the period of incubation of the poison which produces the disease was ascertained, by the same kind of evidence which is now in the hands of all of us, to be a variable period, not less, perhaps, than fifteen days in any of the histories reported, oftenest more than twenty days, and certainly extending to forty days and upwards. This was important information for us in the early part of August, while the disease was regarded as somewhat mysterious. Dr. Rauch, in his letter, dated August 19, stated that sixty-two cows had died of the disease in the fifth ward of Chicago, and that its presence had been recognized there from the first of that month. Dr. Hodges, president of the board of health of St. Louis, communicated important records of the disease, as it had prevailed in former years near St. Louis, and various parts of Missouri. Dr. Neal, health officer of Dayton, Ohio, communicated the result of his observations, from day to day, upon the disease which had infected a herd near that city. F. A. Aitkins, Esq., of Odell, Illinois, gave the history of events which were occurring in his neighborhood. The experience in Warren county, Indiana, and in Summit county, Ohio, was kindly made known to the New York sanitary board. Like the record of each infected herd, and each diseased animal which came under the investigation of this board, all this experience, gathered by correspondence, tended to clear up all doubts as to the dependence of the disease upon a contagious principle which could, in all cases, be traced to the Texas cattle, so far as regards the first group of cases which occurred within the first sixty days after exposure of native cattle to the excrement or the trails of those cattle. The sudden and very brief duration of the obvious symptoms, or very last and fatal stage of the disease, seemed fully confirmed. Not a single person among all of the correspondents, who gave us the result of their observations, seemed able to mention any symptoms that could be discovered before this last stage of sickness is reached.

Dr. Neal, of Dayton, Ohio, writes, under date of August: "Up to the time of receiving your letter in behalf of the metropolitan board of health we had no indication of the disease in our midst, but there being a herd of Texas cattle a few miles from us, in due time we have been doomed to suffer. Between August 15th and 25th, eleven native cattle have died, and several are now sick." Mr. Atkins, of Odell, Illinois, states his conviction "that even the filthy cars of the cattle trains of our railroads would become the carriers of the infection from Texas steers."

Whatever was learned from any part of the country concerning this disease, confirms the opinion that there should be thorough disinfection of cattle yards and cattle cars and trains. Hence the sanitary officers of the state of New York did not act blindly when they advised such effectual disinfection by carbolic acid. Whatever the general government may have acquired in its correspondence respecting these diseases, the sanitary officers in New York have deemed it a duty to maintain an independent correspondence, and obtain all the information in their power, and especially to ascertain, if possible, all the facts concerned in the propagation and prevention of the disease.

We begin to fear that there is evidence that the poison from the south may, under favoring circumstances, become naturalized, even in the state of New York and many other states, where large numbers of cattle are accumulated. But it should be mentioned that up to this date the registrar of the metropolitan board of health states that there has been nothing received in the correspondence of the board with the sanitary authorities in other states, which throws much light upon the subject, for the observers who have communicated information upon this point all testify that they have not witnessed the repropagation by the northern cattle; but that it must be remarked that few observers have been so situated that they could study the disease, except in connection with the first group of animals that became infected by it from the excrement of the Texas cattle. The registrar says that the evidence upon this subject must be regarded, thus far, simply in the light of purely negative evidence, and that this vexed question is by no means settled until exact and searching observation shall have been carefully made wherever the disease has been carried.

BRIEF SUMMARY OF THE WORK ACCOMPLISHED BY THE METROPOLITAN BOARD OF HEALTH, ON THE CATTLE DISEASE.

The markets of the metropolitan district of New York demand about 1200 to 1500 head of beef cattle every day. Hence it is plain that its sanitary authorities could not, without culpable negligence, neglect to notice, and, if possible, to prevent the introduction and use of diseased animals for food. When the fact was announced that a destructive disease was spreading among the herds in the very districts from which the choicest meats were supplied to the New York markets; and when it became known, one of the most trustworthy sources of this supply, viz: Mr. Alexander's herds—had already sent an invoice of diseased cattle to this market, the metropolitan sanitary officers lost no time in deciding upon the necessary inquiries and the police regulations which seemed necessary to ascertain the nature and results of this disease, so far as its influence upon human health was concerned.

These duties, though purely sanitary, had to be classified under different heads, as follows:

1st. Inspection of the cattle, whether dead or alive. 2d. Inquiries as to whence they came, and as to what regions were being visited by the disease. 3d. A scientific investigation into the essential nature of the pathology of the disease.

The very first group of diseased cattle which sanitary officers examined, viz: the dying remnant of Mr. Alexander's herd, which reached Communipaw on Friday morning, the 7th day of August last, and that left Homer, Illinois, about one week previous to that date, plainly enough settled the question that this disease is a pestilence that needs all of the sanitary care and all of the scientific investigation it can receive. Now these duties were not likely to be well performed, or even to be performed at all, in any good season, if left to the slow movement of state and national authorities alone. Investigations had to be commenced at once, and were commenced.

The department of inspector speedily grew into an important work of police control, and as soon as the New York state commissioners, Messrs. Patrick, Gould and Allen, had learned the extent of the malady among the cattle, viz: in the third week in August, they nobly came to the aid of the metropolitan health authorities, and added the power of the state to that local power

which the sanitary officers had exercised for the preceding ten days.

The first diseased cattle were discovered on the morning of August 9th, in the drove yards at Communipaw, New Jersey. By the use of the thermometer, it was immediately discovered to be a pestilential disease, for the temperature of some of the cattle that had began to manifest the symptoms of it, was found to be above 107 ° Fahrenheit, a temperature which pertains only to the operation of pestilential poisons in the animal system. Let it here be remarked that an intelligent health officer, whose business it is to examine and investigate diseases, never goes about such duties without a thermometer in his pocket. It should be understood that medical officers fear diseased food, not because it produces, ordinarily, its own like in human beings who eat it, but because it tends to produce obstinate and fatal diarrhœas, subtle and fatal changes in the human blood. In short, because it is filthy and unhealthful to eat diseased and putrid articles of food. It should be remembered just here, that there was, during the last week of July and first ten days of August, an alarming and dreadful increase in the mortality from diarhœal disorders and sudden deaths, which demanded searching sanitary inquiry.

The inspection and police control of all meat cattle brought within the limits of the metropolitan district of New York (which embraces five counties) having been provided for by appointment of myself, a sanitary inspector of the metropolitan board of health, as assistant commissioner for the state, this branch of work was so organized, and authority so concentrated, that it at once prevented panic, fault-finding, and all the chief sources of danger from the arrival of cattle.

PLANS OF ORGANIZATION.

All cattle arriving within the city limits were required to enter quarantine yards for inspection, and were not allowed to leave without a permit, stating that such inspection had been made, and signed by the assistant commissioner.

SCIENTIFIC AND SANITARY INVESTIGATIONS.

Careful post-mortem examinations at the slaughtering of diseased animals were commenced August 9th, in the herd of one hundred and forty-one which Mr. J. F. Alexander's agent, Mr. Fitch, at

Communipaw, ordered to be sacrificed (and here let me say, by the way, that this sacrifice was, under the circumstances, one of those noble acts which redeem manhood from the degeneration of traffic in these days of selfishness). Some thirty carcasses were examined the first day, and three were subjected to searching analytical inspection. The *blood*, the *bile*, the *liver*, the *spleen*, the *flesh*, and the intestinal contents, were also subjected to the most skillful microscopical examination. Even the tick was examined, unworthy as he was of such attention, for we now know that he was an old enemy, familiar to the eye of herdsmen in many countries. The chief result reached in these microscopical examinations was summed up as follows. In a note from Prof. R. Cresson Stiles, deputy registrar of the metropolitan board of health, to the superintendent of the scientific work, Dr. Elisha Harris, on the next day, says: "Concerning the *blood*, I found it decomposed so that the specimen I secured (poured from the bottle containing the clots) consisted of a bloody serum. *Not a single red blood disk could be detected.* The red blood disks had parted with their coloring matter, and the serum was of a dark mahogany color. This evidence of disorganization of the blood is a *most important fact*, as indicating the nature of the disorder." Ordinary observation by the unaided eye showed, of course, precisely the changes which all have seen who have examined the disease in that way —the sloughs in the read, or rennet, or fourth stomach, the darkened mahogany color of the soft muscles, the greenish ochre yellow of the fat, the thick, flaky, almost black, condition of the bile, and its enormous excess in quantity in the gall bladder, the bloody urine, the enlarged and altered appearance of the liver, and the still greater enlargement of the spleen, the bloody straining of the rectum, the jaundiced eye of the diseased creature. But to the critical eye of pathologists and trained medical officers of the board of health, there were no changes discovered in the tissues and organs of these diseased animals that were not plainly attributable to the changes that had occurred in the blood, unless, indeed, it might be, as it possibly was, true, that the liver, the bile, the spleen and the flowing blood, together, were in some way materially responsible for this destruction of animal life. Here, then, commenced the study which has continued, uninterruptedly, from the 9th of August until late in November.

There were three objects to be obtained by this study, in which not the medical profession alone, but all interested in healthy food supply and in profitable cattle raising, herding, grazing, transportation and marketing, may have an equal interest, at least in the two objects we will here first mention. The first object was to ascertain if the disease could be propagated to other animals. The second object was to ascertain by what particular agent or thing, in itself considered, this disease is communicated from one animal to another. Thirdly, to ascertain the precise changes which the disease produces in the fluids and tissues of the animal, and especially to study these changes in such a manner as to ascertain some of the important facts regarding the spreading of pestilential diseases of both men and the lower animals. Under the first head, only a few experiments were undertaken. Mice, rabbits and dogs were fed with portions of the liver, or of the bile, in small quantities, but only in the rabbits was definite evidence of deadly effects produced. Out of a large number of rabbits fed, all, excepting one, died with symptoms so closely resembling the cattle disease as to leave but little doubt that they were poisoned by it, and this, too, in a very definite and specific manner. This point will be noticed when we come to speak of the parasite which is a constant attendant upon the disease in the blood and bile of the diseased animals. Under the second head for study, the microscope was put to the test to discover if the intestinal contents of the diseased cattle contained anything that might account for the spreading of the disease. But this was so much like looking for a needle in a haystack, that it became expedient to make the search principally in the contents of the gall bladder, for whatever is contained therein is sure to be poured out into the intestines. This search has been amply rewarded, for on the 13th day of August, in examining the bile of a number of badly diseased animals that were being examined in our presence, near the Hackensack river, the microscope, in the skillful hands of Dr. Stiles, revealed the presence of fungus spores, which, in the language of the scientific men who give names to these things, would be called *Cryptococcii*, but in common phraseology may be simply said to resemble the yeast fungus.

We wish to be distinctly understood here, that we do not suppose it was yeast fungus—indeed it was not; but it has at last been ascertained to be the spore germs of a minute parasite called

the *pitletia caries*, and which has its natural home about the husks and joints of certain grasses and herbage growing in warm latitudes. But in the fluids of the living animal, within the cavities of its organs of digestion, these microscopic growths do not attain that full development which they bore in the outside world; but, as the microscopists and vegetable physiologists tell us, regarding the minute organisms of the vegetable creation, the ready method which these spores of minute parasites adopt in their re-propagation or increase, when not growing upon their natural soil or elements, is simply to multiply as cells, by growing and breaking up or dividing with enormous rapidity, using whatever elements they float in for sustaining this increase of theirs. And this is the way these little fungus spores grow in the blood and the bile of the diseased animals. We should here mention that the spores were found abundant in the blood, as well as in the bile, of every diseased animal that has been slaughtered, or found dead of this disease, within the metropolitan district. It should be further stated that these spores were found abundantly in the blood freshly drawn from the cervical vein of the sick animal when alive, and that, although found in every drop of bile immediately after slaughtering, the same specimen of bile would present a vastly increased quantity of these little fungus growths after exposure for a day or two in bottles, or in the open air. Of course it was very desirable to know to what class of microscopic parasites which grow in the open air, and upon green herbage, these spores or seeds belong. In other words, these spores must be planted, to see what kind of plants they would produce. They were planted in every kind of way, in every kind of soil: as the fresh-cut slice of an apple, the inside rind of an orange, the clean-washed, rancous surface of an intestine of a freshly killed healthy animal; they were planted in a mixture of sugar and of gum, in water, upon hard caked bread, upon clean glass, etc., etc.; and upon favorable soil they grew to perfection, which is illustrated upon sketches here presented. They bore seed—that is, spores—which were prec sely like the seed or spores originally planted. Thus, in various ways, by nice experimentation, there has been a very satisfactory identification and discovery of *the name and nature* of the microscopic parasite, to which these still more minute and microscopic spores or seed belong.

So much for the revelations of the microscope. This field of

study was deliberately surveyed, and these inquiries planned: *First*, with the design of discovering whatever might be discovered concerning the propagation of this minute organism; and *secondly*, it was hoped that the relations of this spore to some fungus growth in the vegetable world might be ascertained, with which the Texas cattle were concerned. A far greater degree of success than was expected seems to have attended their line of inquiry. The medical officers who planned and directed it were sufficiently masters of the present state of scientific knowledge on these and kindred subjects to grasp the whole problem, and make no mistakes. Indeed, it has come to pass, since the last outbreak of cholera in its march across the continent, in 1865, 1866 and 1867, that this kind of exact inquiry has come to be a part of the duty of scientific medical officers. No one need be told that if this very parasite, which, in its lowest and most rapid stages of development, has now been found in the blood and bile of Illinois cattle that took the disease by feeding over the ground where the Texas cattle dropped their excrement, has now, indeed, been almost absolutely demonstrated to be the seed which is borne in the spore-vessels of a parasite, which grows upon grasses and herbage on which the Texas herds graze when *en route* from the bottom lands of the south to the prairies of Illinois and Indiana. We have an equally good demonstration that the food upon which the Texas cattle feed is at least partly responsible for the spread of the deadly infection. Yet it is due to Dr. Harris, as the author of this generalization, to say that he believes that the parasite may be guilty of only half the evil; for in cattle mercifully treated, and properly fed, it is impossible that the blood and fluids would become over-run with this poison. Chemistry, the handmaid of modern physiology, has been required to interpret such changes as it could take cognizance of, in the blood, bile, liver and spleen of the diseased animals. Over fifty very careful analyses have been made by Prof. C. F. Chandler, chemist to the metropolitan board of health, and superintendent of school mines of Columbia college. The general result of all this labor in the laboratory may be stated as follows: The blood becomes watery, (that is, loses the normal amount of its solid constituents, and loses them very rapidly in the last or obvious stages of the disease;) 2nd, in animals killed when convalescing from the disease, the chemist found the blood excessively watery—the blood cor-

puscles being in a proportion less than one-half the normal standard, and the albuminous portion of the blood very much diminished. I am permitted by the board of health to quote from the record of Professor Chandler's analysis the following illustrative result:

	Water	Total solids.	Fibrin.	Red corpuscle.	Albumen.	Salts.
No. 1—Sick ox, slaughtered in the last stage of the disease.....	888.9	111.1	5.6	None.	89.5	8.1
No. 2—Sick ox, slaughtered in the very last stage of the disease—a typical case of the disease, 60 days from incubation	876.9	123 1	7 8	13.6	60.8	14.1
No. 3—Ox killed on the eighth day of convalescence—one of Mr. Alexander's herd, from Homer, Illinois	854.	134.1	10.9	41.6	68.	5.6

Chemistry and the microscope, also, revealed the fact that the liver in the diseased animal is undergoing what is termed fatty degeneration. The extent of this change varies considerably in different animals, but it is a very invariable and constant change. The microscope shows that it consists simply in the deposit of fat in the minute cells of the liver, precisely as occurs when certain poisons are fed to animals.

The bile is secreted in excessive quantity, and is proved by very nice experiments to be so poisonous that if a very small quantity of it enters into circulation of the blood, that the blood corpuscles would be quickly destroyed by it; and this proves to be the fact. The greenish and dark *ochry color* of the fat and other light tissues, and the mahogany color of the muscles is found to be due to this admixture of bile and the breaking down of the red corpuscles.

This is proved in many ways, but in none so beautifully as in one of the results which is here shown by a microscopic view of crystals of hernatoidine, which can only be produced by the destruction of the red corpuscles in particular ways. This result of blood destruction is found in various tissues of the body, but nowhere so abundantly as in the liver, the spleen and the bile. Perhaps these might be considered as experiments of science too

nice to be useful, but, far from this, they are among the most definite, accurate and trustworthy guides to the treatment which the whole subject of this inquiry upon the cattle disease should receive.

To any person who will carefully look into this subject from the standpoint we have here indicated as having been occupied by the medical officers of the metropolitan board of health, and which, let it be said to the honor of the non-medical but most enlightened gentlemen who constitute the cattle commissioners of the State of New York, are heartily appreciated by them, it will plainly appear that whatever knowledge is required in this broad and fruitful field of scientific researches concerning this contagious but most anomalous disease, will contribute directly and greatly to the welfare of mankind, by adding knowledge in a field where knowledge is most difficult to be obtained, concerning the mysteries of pestilences and contagions which afflict the human family.

THE PRESERVATION OF COLORED SKETCHES TO ILLUSTRATE THE MORBID ANATOMY OF THIS DISEASE.

After viewing the first dissections of diseased cattle, on the 9th of August the registrar of the board of health of the metropolitan district, who had direction of this investigation, employed Mr. Kohlen, a skillful artist, whose life has been devoted to painting automatic sketches from nature, to take drawings at the time and place of slaughter of the diseased animals. Nearly one hundred such illustrations have been taken; and of these, upwards of fifty are being cromo-lithographed, and will be soon in the hands of all who take an interest in studying this subject. They will illustrate the report of the Metropolitan Board of Health, and the special report which the New York Cattle Plague Commissioners are preparing, as well as the New York State Agricultural Society's report, which will embody a special contribution for the New York state commissioners. In conclusion, it should be said that all this investigation in New York has been pursued simply in the ordinary course of the administration of the new sanitary government. Then no one man claims any distinction or honor in it; and whatever contributions the medical officers of that board are now about to make to a practical and scientific knowledge of this disease, will be made without any pretention.

PROF. CHADBOURNE, of Wisconsin—I would like, Mr. President, to ask the gentleman one question: if he understands

that the spores which are produced by this plant, when growing in the air, in orange-peel, apple, etc., are like the cells that propagate by subdivision in the blood and in the bile of the animal?

Dr. Morris—They take a different form of development in the open air, sir. In the blood and bile, they simply multiply as spores, by division, never progressing any further.

Prof. Chadbourne—You consider them as true spores that multiply in the blood and bile.

Dr. Morris—Yes, sir; the spore seed never progressing any further in development in that condition; but when planted in the air at certain temperatures, they develop into the plant from which they originally came, or into those forms of plants.

Mr. Gould, of New York—I would like to ask you, sir, if these plants, thus grown in the open air, do not develop spores, while growing, which are identical with those found in the blood.

Dr. Morris—They do, sir, as will be seen by the plates.

The President—I should like to hear (and I know that it is the desire of the convention) from Dr. Rauch, of the Chicago Board of Health.

Dr. Rauch—Mr. President and gentlemen, I will not occupy your attention for a great length of time, but give, in as concise a manner as possible, the action and observations of the Board of Health of Chicago, and, as far as I can, corroborate the statements made by Mr. Gould and Dr. Morris with regard to the microscopical investigations into the nature and character of this disease by the Metropolitan Board of Health of New York, as substantiated by those carried on by the Board of Health of Chicago; and also, for the purpose of making their history of this plague as complete as possible, I will call your attention to facts not heretofore mentioned.

The first case at the Union Stock Yards which terminated fatally, occurred July 25th, soon after the arrival of the train that brought the animal there. Two days after, two dead steers were found in a train that arrived from the infected district (Tolona, in central Illinois), with several animals suffering from the disease. The next day, another train arrived with diseased steers in it. This train was not permitted to remain. On July 29th, a cow died belonging to a citizen of the fifth ward. In the meantime, a commission was sent to Tolona, Cairo and other places where the disease prevailed, by the packer's association. This commis-

sion returned to Chicago August 4th, and it was supposed that owing to the opposition of the people living along the line of the Illinois Central railroad, no more Texas cattle would be sent to Chicago, and that we need have no fears about the disease. This was before much was known about its spread and character. Hearing that there were cases of the Texas fever at the Union Stock Yards, I directed the health officer, Mr. Burnam, to visit the place. This he did August 2d, and reported no diseased animals. On the 3d inst., another cow died near the stock yards. I then directed the sanitary inspector of that ward, Dr. Mannheimer, to investigate the nature of this disease, and at the same time, instructed the health officer and sanitary policemen of the ward to assist Dr. Mannheimer, in every way, in obtaining information.

I visited the stock yards; and at the meeting of the board, August 11th, I called attention to the fact that cows were dying in the neighborhood of the stock yards, and also, to the action already taken; when further investigation was ordered, and such steps taken to prevent the spread of the disease, and at the same time to prevent the introduction of the meat of diseased animals into the market. I had, also, directed that every facility should be given, and all assistance rendered to Prof. Gamgee, who was investigating this disease for the agricultural bureau at Washington.

The number of deaths increased daily until the 20th of August, particularly in the fifth ward, when they began to diminish. In order that you may understand the history of this plague, I will state that the fifth ward comprises a large territory, the greater portion of which is unoccupied and in its primitive state, in the extreme south-western portion of the city, adjoining the Union stock yards, and where, for the purpose of economy, herds of Texas cattle were grazed at intervals while awaiting sale, from the month of May until the action of the board prevented it, in August. These animals were also grazed upon the prairie, east, south, and west of the stock yards. No herds were, at any time, permitted to graze east of the Pittsburgh and Fort Wayne railroad, for purposes of convenience, and very fortunately for the citizens of the southern division of the city, as undoubtedly the mortality would have been much greater. On this ground, the cows belonging to the fifth ward grazed, and where the Texas

fever prevailed most, and where the greatest mortality occurred. A large number of cows grazed east of the Pittsburgh and Fort Wayne railroad, but none of these were affected, with the exception of a few, which were in the habit of frequenting a spot below the city limits, on the line of the Illinois Central, and Michigan Central railroad, connecting with the stock yards, where the cattle cars were cleaned. These cows belong to citizens of the fourth ward. Other cases occurred near Calumet, Junction, Summit, Lyons, and south and west of the stock yards, where herds of Texas cattle had been driven, or grazed, or where infected native cattle had been sent from the stock yards. One case occurred in the seventh ward, of a cow, that had been purchased several days before from a farmer living near Brighton, but which, at the time of purchase, showed no signs of the disease. As far as we have been able to learn, 147 milch cows, one heifer and four steers belonging to citizens of the fifth ward died between July 29th and October 10 h. At the stock yards thirteen steers died; in the fourth ward (the extreme southern ward of the city, and east of the stock yards) ten; outside of the city limits and near the stock yards, fifty-three; and in other parts of Cook county as far as heard from, ninety-five. Of the animals condemned and killed at the slaughter houses, there were seventy-eight. In these the disease was so well marked that it was unmistakable, while a great many were found in the incipient, and still more in the convalescent stages, so that the board did not feel warranted in condemning the animals. This was particularly the case with regard to the Texas cattle. Six of these were found suffering with the acute symptoms, so well marked, that they were condemned; making a total of 401 animals that died of this disease, and were slaughtered within the limits of Cook county.

Much difficulty was experienced, at the outset, in obtaining reliable information, owing to diversity of opinion and conflicting interests. (We literally knew nothing about it.) In fact, so much was this the case, that it was soon discovered that it was necessary to exclude all cattle coming from infected districts, whether native or Texas, from the stock yards; to quarantine all Texas and suspected native cattle that were there; to prevent the herding of Texas cattle in the vicinity; and in order to protect other points, to prevent the departure from the stock yards of Texas and other animals with regard to whose condition any doubt was entertained,

as in the early stages of the disease, it was found impossible to tell by external appearances whether the cattle were affected or not. An inspector was appointed at the Union stock yards, and no animals were permitted to be removed without his certificate, either for the home or distant market. It was soon found that even these precautions were not sufficient to keep the meat of diseased animals out of the market. Inspectors were placed at all the slaughter houses, and the internal organs, particularly the spleen, liver and bladder of all cattle slaughtered were examined; and at the suggestion of Prof. Gamgee, the spleens were weighed, as enlargement of this organ was always present in this disease, and it was supposed to be the best way of diagnosing it. In a few days the livers were ordered to be weighed and a record in both instances kept; and for the purpose of learning as much as possible with regard to the history of all animals received, the inspector at the stock yards furnished a daily report from whence they came, their condition, etc., which facts were also embraced in his certificate, which was taken by the parties purchasing animals to be slaughtered, and the number compared with those brought to the slaughter house by the inspector there, so that none were taken there without undergoing inspection.

I visited the stock yards daily and the slaughter houses twice a day; and in order to make this inspection as perfect as possible, the spleens, and frequently the livers of all the animals slaughtered, were retained for my inspection and comparison with the number in the certificate. Reports were also required, from the wholesale dealers in meat throughout the city, of the number and from whom the carcasses of beef came that they sold, so that, in this way, all the animals brought to Chicago were known, and in what manner they were disposed of.

The stock yard and railroad authorities heartily co-operated, and in a short time the stock men and the butchers acquiesced, so that very soon confidence was restored, and the trade was improved. Whenever an animal was found that showed positive or suspected signs of disease, my attention was called to it, in my visits to the slaughter houses, and if the suspicion of the inspector was confirmed, the carcass was consigned to the rendering tank. But little opposition was made by the owners; and as a general rule they cheerfully acquiesced in the decision. Such was the excitement with regard to diseased beef that the consumption rapidly

fell off, and with it the price, and as a necessary consequence great stagnation of the trade. The efforts of the board soon restored confidence, and with it a more hearty co-operation and acquiescence in its orders by all parties interested. Detectives were also employed, as it was discovered that the carcasses of animals were brought in from the country, that had been suffering from this disease. This was soon broken up, and in a few days the entire beef supply of the city was under the control of the board; and I have yet to learn of a case of the Texas fever that occurred elsewhere from cattle that were shipped from the stock yards, after this system of inspection was inaugurated.

So far no notice in the discription of the symptoms of this disease has been taken of the chill by which it is ushered it, nor of the difficulty of urination. With regard to the first symptom, I would state that three cases fell under my observation in which this was well marked, and I have no doubt but that such was the case in nearly all of the animals that suffered. In studying diseases of animals, much difficulty is experienced from the fact of their not being constantly under observation, and nothing can be learned but by physical examination. Generally speaking the first evidence that the owners of cows noticed, was a diminution of the secretion of the milk. There was not that aggravation of the symptoms in the animals, observed at Chicago, which was seen at New York. This was, no doubt, owing to the hardships and exposure incident to the mode of their transportation; and from what I have seen myself, both at Chicago and New York, I am satisfied that in many cases if the animals had been allowed to remain on the pastures undisturbed, they would not have died.

Nearly all the cattle I saw were free from ticks, and none could be found, special care being taken from the outset to ascertain whether these insects had any agency in causing this disease. As a general rule, none were found, and not a trace of them could be found in the stomach of animals that died of this disease, or in any that were killed. Dr. Mannheimer devoted much time to the investigation of this question, and such was also the result of the observation of others, among them Prof. Gamgee, and Mr. Emery of the *Prairie Farmer*.

From August 3d, to October 10th, Dr. Mannheimer and myself made 143 post-mortem examinations of cattle which had died, or were killed while suffering with the Texas fever. In nearly all the

same pathological conditions were found which have already been so minutely described and observed by the New York board, with the exception that they were not so aggravated. The sloughs and ulcers in the obomassum or true stomach, were not seen, but patches of abrasion with increased varcularity were frequently found. In the small intestines were observed small yellowish spots or points, of which I have heard no mention made. The glands of peyer and brunner were carefully examined, but no ulceration was found in a single case. In only one animal, to which I shall allude hereafter, was the yellowish-ochre-looking color of the fat, and the mahogany color of the muscles observed. In fact in nearly all the animals examined, there was no change perceptible to the naked eye in the appearance of the fat and muscles from animals in perfect health. It was soon found, in consequence of the difficulty in detecting the disease in the living animal, unless in very marked cases, and after the removal of the viscera after death, that the only way to make the inspection efficient, and to protect the public health, was to examine the internal organs of all animals slaughtered. In fact I found it utterly impossible, as a general rule, to decide by the appearance of the carcass, after the viscera had been removed, whether it was fit for market or not. This was especially the case in the early stages of the disease. For instance in a herd of thirty-three that were suspected, only four showed marked signs before being slaughtered, with that increase of temperature which was found to be so infallible a test in diagnosing this plague by the New York board; but upon slaughtering them, I found that the spleen, liver and urine, presented such decided evidences of disease, that I condemned eleven, and was in doubt about five more. The spleens of all that were condemned weighed over four pounds, and bloody urine was found in nine of them. In one of them the spleen weighed eight pounds, but in this case there was no bloody urine. I afterward noticed this fact: that where the enlargement of the spleen was greatest, no bloody urine was found. These cattle were slaughtered two days after the inspection of the viscera at the slaughter-houses was commenced, and I must confess to a keen appreciation of the responsibility resting upon me, in thus imposing so heavy a loss upon the owners, and at the same time discharge my duty in protecting the public health. In the conclusion

arrived at, all who saw the affected organs, agreed, and the owners cheerfully acquiesced.

In this connection I would state, that the thermometer, although assisting in determining the disease in a suspected animal, was not found in our hands of so much service, while its application to all cases was found impracticable.

Two cases were found where rupture of the spleen had taken place. One of them, examined on September 21st, was particularly noticeable, as about four gallons of bloody serum were found in the cavity of the abdomen, and the bladder was enormously distended, containing nearly three gallons of bloody urine. The spleen weighed ten and a half pounds. At this time the cases that we saw were more aggravated than usual. The liver was generally enlarged, but not always, and the heaviest liver seen weighed twenty-nine pounds, and in all cases examined fatty degeneration was found. Ecchymosed spots were occasionally met with in the heart, both externally and internally. The condition of the rectum so constantly present in the cases examined in New York, was occasionally seen, and the flaky character of the bile was seen in rare instances. In many of the stomachs of the Texas cattle, cicatrices were seen, proving the existence of disease at some period.

With regard to the transmittal of this disease by native to native cattle, I must confess that notwithstanding the weight of the testimony is against it, I am inclined to believe that such can and does take place. I can see no good reason why such should not be the case.

Mr. Piper, of Illinois—Allow me to ask if you have any evidence that would be conclusive on that point, which you can give the convention?

Dr. Rauch—Several instances of this character fell under my observation during the past three months, but the most conclusive evidence I have is, that native cattle were purchased at Chicago in August, and taken to Lebanon county, Pennsylvania, and that a short time after they died, and that other native cattle on the same farm, and neighborhood, died; and that no Texas cattle had been nearer the place where these animals died, than the railroad, while in transit to New York and Philadelphia, which must be at least three miles distant. My attention was called to these cases by a friend, who wished to know of me whether it would be safe

to purchase cattle coming from Chicago, just as I was leaving Lebanon, about five weeks ago. In all other cases that were noticed, the Texas cattle had been near. The assertions that native cattle die of this disease, and do not communicate it to other native cattle; that Texas cattle are perfectly healthy, and still cause a disease that is fatal to native cattle, and that they do not die of this disease, are such anomolies in the history of contagious diseases, that on general principles, I am not disposed to believe it. I must confess that in my opinion there is still much to be learned with regard to this malady. In all cases that came under our observations, where native cattle were not affected, they were stall-fed, and did not graze where Texas or sick native cattle had grazed, which, as far as our experience went, was necessary to transmit this disease.

Almost every imaginable course of treatment was pursued, but it was impossible to tell with what success. At first all the cattle affected died, and it was the general impression that there was not much use in treatment. With this feeling I treated seventeen during the month of September, seven of which recovered. Am not prepared to say that they would not have recovered, had they not been subjected to the course of treatment I put them on. I recollect one case where the animal was bled freely when the first symptom appeared, dying in a very short time after—in fact sooner than any case that came under my observation. I have no doubt but that the free bleeding hastened death, having, on general principles, discountenanced blood-letting before; and the result in this case was strictly in accordance with my views of the nature of this malady.

Carbolic acid, in its different forms, was made use of freely as a disinfectant, particularly at the stock yards, but not as an internal remedy.

THE PRESIDENT—Did the animals that recovered enjoy as perfect health as before they were attacked with the disease?

DR. RAUCH—In some instances they did, convalescing very rapidly, with speedy restoration of the milk in cows.

THE PRESIDENT—They did ultimately arrive at perfect health?

DR. RAUCH—Yes, sir, I saw several of them recently looking very well, and in good health.

DR. TOWNSEND, of Iowa—Just one question, if you please. I believe it is a fact beyond all question, that certain poisonous sub-

stances which affect oxen very injuriously, are almost innocuous in the case of cows secreting largely. Is that true of this special poison?

Dr. Rauch—So far as my own observation goes, it was principally among cows secreting milk, and judging from my own experience and what I have been able to learn from other sources, cows were more apt to suffer than oxen, or at least there seemed to be a greater susceptibility to the influence of this poison.

Dr. Townsend—The secreting of milk does not exempt them?

Dr. Rauch—No, sir, not at all.

Mr. McMillan, of Ohio—I think you stated, sir, that out of seventeen cases, you cured seven?

Dr. Rauch—Yes, sir.

Mr. McMillen—Will you be kind enough to tell us how you treated them?

Dr. Rauch—When I first saw them, I gave them large quantities of flax-seed tea, with half an ounce of sweet spirits of nitre three times a day. The next day one drachm of sulphate of quinia, dissolved in a fluid drachm of aromatic sulphuric acid, was given, either twice or three times a day, in a pint of water, as I thought was necessary. This treatment was continued until a change for the worse or better was observed. The flax-seed tea was given during the entire time of treatment. I have no doubt that in the early stages of the disease, purgatives that would promote secretion of the bile would be beneficial, but it is exceedingly difficult to pursue a systematic course of treatment, arising mainly from the want of interest taken in the animal by the owner, and the trouble in obtaining correct information with regard to the symptoms, from want of observation. The flax-seed tea and sweet spirits of nitre were given with a view to allay the febrile excitement and promote secretion of urine, which was generally scant and high-colored, even before it became bloody, accompanied by difficulty in voiding. The quinia was given as an antiperiodic and tonic, as in several cases I noticed the disease ushered in with a decided chill, and the fact that the spleen was always enlarged, presenting a feature similar to "ague cake," so common in human beings who had been suffering from the effects of malaria for a long time. The aromatic suphuric acid was added for the purpose of acting as a solvent of the quinia, a tonic and astringent, and

at the same time to cause the destruction of the spores in the blood, and prevent the lowering of its vitality.

The next question to which your attention is called, is whether or not the Texas cattle suffer from this disease? From all of the sources of information within my reach, and particularly from consultation with those in whom I had reason to have confidence, I was informed that they were "perfectly healthy, and exhibited no traces whatever of this disease," and such was apparently the case. But I had my doubts, as I could not understand how so widespread and fatal a plague could be caused by cattle enjoying perfect health, although I had, up to this time, seen nothing to the contrary. In fact, for a number of days, I was in doubt what course to pursue, owing to the diversity of opinion, prompted more by interest than a desire to arrive at the truth.

We were at first occupied mainly in investigating the disease in the native animals, and preventing the sale of meat from this source. With these doubts, I directed the inspectors to examine the internal organs of the Texas animals, particularly the spleens, and when anything unusual in their appearance was observed, to keep them for my inspection. At this period I devoted much time to the examination of the cattle slaughtered, and while thus engaged, I noticed that the spleens of the Texas cattle were larger, and that the color of nearly all was like castile soap. My attention was called on the 20th of August, at one of the slaughter houses, to four spleens, weighing from four to five pounds, presenting the dark mottled appearance so characteristic of the color of this organ in the native animals that died, and when cut into they presented the same appearance of disorganization. The livers and urine of these animals were also examined, but they presented nothing unusual to the naked eye. Specimens of each were submitted to Dr. Mannheimer for microscopic examination, without telling him from whence they were obtained. After careful examination, he reported that the specimens presented the same structural lesions and changes, but not in so marked a degree as in cattle that had died, and that he supposed they were convalescing—at the same time showing me the specimens under the microscope.

From this time forward all cattle slaughtered were subjected to the same scrutiny, and a record of the weights of the spleens was kept. The following table, showing the relative weights of Texas, Cherokee and native cattle, confirmed me in the opinion that

nearly all southern cattle were, or had been, more or less affected, and that there is a marked difference in the size and weight of this organ, compared with the native cattle. It will be noticed that none of the Cherokee and Texas spleens weighed less than two pounds, while there was but one of the native spleens that weighed so much. I will also state that nearly all the cattle that were called Cherokee, were in reality Texas cattle, of a smaller size, and younger. This deception was practiced, with the hope of finding a better sale for them, owing to the prejudice existing at this time to Texas cattle.

AUGUST 26TH TO AUGUST 30TH.

Cherokee spleens	2¼	2½	2¼	2¼	3	
"	2½	2½	2¼	2¼	3½	
"	2¼	2¼	2¼	2¼	2¼	
"	2½	2½	2¼	2¼	2¼	
"	2	2	2½	2½	2½	
"	2½	2	2¼	2	2	
"	2¼	2½	2¼	2½	2	
"	2¼	2	2½	2¼	2½	
"	2½	2¼	2¼	2¼	2½	
"	2¼	2½	2½	2½	2	
"	2½	2½	2¼	2¼	2½	
"	2¼	2¼	2½	2½	2	
"	2½	2½	2¼	2¼	2½	
"	2¼	2¼	2½	2½	2¼	
"	2½	2¼	2¼	2¼	2	
"	2½	2¼	2¼	2½	2½	
"	2	2¼	2½	2½	2½	
"	2	2½	2¼	3	2	
"	2¼	2½	2¼	3½	2¼	
"	2	2¼	2½	3		
"	2¼	2½	2½	2½	127	301
"	2½	2¼	2½	2¼		
"	2½	2¼	2¼	2½		
"	2¼	2¼	2¼	2		
"	2¼	2½	2¼	2½		
"	2½	2¼	2¼	2¼		
"	2¼	2¼	2¼	2¼		

Average.....2.37

Texas spleens...	3½	2	2½	3½	3	3½	2½	
"	3½	2½	3½	3½	2	2½	2½	
"	3	2½	3	3	3	2	2½	
"	2½	2½	3½	3	3½	2½	3½	
"	2½	2½	3½	3	2½	3	3½	
"	2½	2½	3½	4	2½	2½	3½	
"	2½	2½	3	2½	2½	2	3½	
"	2½	3	2½	2½	2½	3½	3½	
"	2½	2½	3½	3½	2½	3	4	
"	3	2½	3½	3	3½	2½	2½	
"	3½	2	3	2½	3½	2½	3½	
"	3	2	3½	2½	3½	3	3½	
"	2½	2½	3½	2½	3½	2½	3½	
"	2½	2	3½	2½	2½	2	2½	
"	3	3	2½	3½	3	2½	3	
"	2	3½	2½	2½	3½	2½	2½	
"	2½	3	2½	3	2½	3	2½	
"	3	2	3	3½	3	3½	2½	
"	3½	2½	2½	2½	3½	3½	3½	
"	2½	2	3	2½	3½	4	3½	
"	2	2½	2½	2½	2½	3½	3	
"	2½	3½	2½	2½	2½	3½	2½	
"	2½	3½	3	3½	2½	3½	2½	
"	2½	3½	2½	2½	3½	3½	2½	
"	3	3½	3½	2½	3½	4	2½	
"	3½	3½	2½	3½	2½	3½		
"	2½	3	3	2½	2½	2½	187	526

Average.....2.81

Native spleens...	1½	1	1½	1½	1½			
"	1½	1½	1½	1½	1½			
"	1½	1½	1½	1½	1½			
"	1½	1½	1½	1½	1½			
"	1½	1½	1½	1½	1½			
"	1½	1½	2	1½	1½			
"	1½	1½	1½

Several days after, my attention was called to an acute case of this disease, well marked, with a spleen weighing eight pounds, of which this is a photograph. The liver was also enlarged, but there was no bloody urine present. In other respects the lesions and changes were the same as in native cattle. Five more cases were found during the month of September, in only one of which, however, was bloody urine found in the bladder. These cases were so well marked that they were condemned, one of them presenting the greenish tinge of the fat, and the mahogany color of the meat, so commonly seen by the New York board. This animal had just arrived from Abilene, and it is but justice to say, that I think that the hardships of the journey had much to do with its condition. With these facts before me, I did not hesitate to announce that the Texas cattle were not in perfect health, and my observations since have confirmed me in this opinion, and they have also been substantiated by others.

After the practice of weighing spleens had been continued for several days, it became apparent that important deductions could be drawn from this mode of investigation, while at the same time the inspection would be conducted more minutely. The weights of the liver was directed to be taken, so that the relation of the two organs, in the same animal, could be settled, and whatever changes climate, breed, and care of them exercised, could be ascertained. It had already been settled that the spleens of the southern cattle weighed more, and were larger than in native cattle, but, to my astonishment, the conditions with regard to the liver were reversed. As a general rule, it was found that when the animal, native or southern, was in good condition, the spleen weighed less and the liver more than when the opposite was the case. When the animals were well cared for, the spleens were small and the livers large, and in cases where the animals had been transported or driven a great distance, or received but little care, the spleens were much enlarged, with a proportionate decrease in the size of the liver. We weighed them indiscriminately, no distinction being made in the sex at first, but a few of them were separated. I have prepared from the records of the board of health the following table, which gives the weight of 8,403 spleens, and 7,957 livers, of native, Texas and Cherokee cattle:

Cattle.	Month.	No.	Ag. Spleens.	Av. Spleens.	Ag. Livers.	Av. Livers.
Native—Male and female....	Aug..	93	130	1.40	1,191	12.80
" " "	Aug..	132	184	1.39	.....	.....
" " "	Sept..	1246	1846	1.48	16,522	13.26
" " "	Oct...	124	163	1.31	1,610	13
" "	Sept..	257	373	1.45	2,921	11.36
" "	Oct...	167	203	1.21	2,252	13.42
" female.....	Sept..	1444	1997	1.38	17,794	12.32
" "	Oct...	1455	1745	1.20	19,506	13.40
Texan—Male and female....	Aug..	187	526	2.81	.....	.....
" " "	Sept..	252	652	2.58	3,002	11.91
" " "	Oct...	29	112	3.86	309	10.65
" "	Sept..	669	1464	2.18	8,222	12.29
" "	Oct...	1247	2944	2.36	16,045	12.86
" female.....	Sept..	29	70	2.41	360	12.41
Cherokee—Male and female..	Aug..	10	29	2.90	100	10
" " " ..	Aug..	127	301	2.37	.....	.....
" " " ..	Sept..	396	922	2 33	4,282	11.32
" " " ..	Oct...	24	89	3.70	254	10.58
" " .....C.	Sept..	363	580	1.60	3,742	10.31
" female.....	Sept..	152	241	1.58	1,622	10.66
Total No. of spleens..8403						
" " livers....7957						

From the time we commenced the inspection of the internal organs to October 25th, we examined 16,800 head of cattle. But few of the animals that were condemned are included in this list. Notes of these cases were taken by myself. It will be noticed that in the month of October, that in twenty-nine cases of Texas cattle slaughtered, the average weight of the spleens was nearly four pounds, while, in the same month, twenty-four Cherokee cattle were killed, when the spleen averaged about three pounds and a quarter. Both these lots of cattle were in a bad condition, and had been transported a great distance.

The weight of the Cherokee cattle was also less than that of native cattle included in this list, so that, for purposes of comparison, the Cherokee spleens may be said to weigh nearly as much as the Texas spleens. Evidences of former disease were found in a great many of the Texas and Cherokee cattle.

DR. CLENDENNIN, of Ohio—Will the gentleman be kind enough to inform us if these statistics apply strictly to healthy cattle?

DR. RAUCH—Not all of them.

DR. CLENDENNIN—How are we to distinguish?

DR. RAUCH—As a general rule they do, though a few of them were of cattle positively diseased, but these do not make much difference in the total average.

With regard to the microscopical observations made, I would state that, fortunately, Dr. Mannheimer, to whom, in the ordinary routine of duty as sanitary inspector of the fifth ward, the investigation of this disease fell, was a good microscopist, and such was the accuracy of his examinations, made in the first week in August, that subsequent and closer investigation verified them. He had examined the different organs, tissues, blood, bile, urine, and milk, with a microscope of not very great power, when my attention was called, by a letter from Dr. E. Harris, of the New York board of health, to the discovery of a parasite in the blood, bile and urine of diseased native animals, by Dr. Stiles, stating at the same time that a greater power was necessary to see it than that we had made use of. I immediately procured the most powerful instrument in Chicago, and in a very short time the discovery of Dr. Stiles was confirmed.

Our attention was next directed to the blood, bile and urine of Texas cattle, where we also found the spores, but not so abundant as in native animals. The plant was also seen, but not so well defined. I immediately communicated our results to Dr. Harris, and in a very short time our investigations with regard to the Texas cattle were confirmed by them. The investigations of the New York board, in this respect, were conducted with much care and minuteness, as well as everything pertaining to the pathology of this disease.

As no mention has been made of the microscopic appearance of the milk, I would say that the fat cells, or globules, were more abundant than in health. From what I have seen I am satisfied that frost kills the spores.

Dr. Miles, of Michigan—Allow me to ask if any spores were found in the blood of animals apparently healthy?

Dr. Rauch—Not as a general rule, although occasionally we found animals in apparent health, that were really diseased, upon subjecting the organs and fluids to microscopic investigation. In these we found spores, but since the early part of October, no spores or plants were found in any of the animals examined by Dr. Mannheimer.

Dr. Miles—It was only after the external symptoms became severe that they were seen?

Dr. Rauch—Yes, sir; this was the case with the native cattle, but they were also found in the Texas cattle, who were apparently healthy, but not in such great abundance.

PROF. CHADBOURNE, of Wisconsin—Will you be kind enough to inform us, sir, if you discovered any difference between the plant and the spores of the plant as found in animals.

DR. RAUCH—Yes, sir, the spores were more commonly seen, while occasionally we thought we saw the plant.

PROF. CHADBOURNE—How did they differ?

DR. RAUCH—The plant was composed of a series of continuous cells or joints, with a number of spores surrounding the tip or end, while the spores were simple dots.

DR. TOWNSEND, of Iowa—I beg pardon for interrupting you, but I should like to know if you noticed any well-marked disease in the human subject produced by the use of diseased meat?

DR. RAUCH—In reply I would state that special attention was paid to this subject. In a short time after the board of health commenced their investigations, and exercised a surveillance over the stock yards, slaughter houses, and the meats sold for food in the Chicago market, all danger from this source was averted, as no diseased meat was permitted to be sold. In addition to guarding the usual avenues through which the market of Chicago was supplied, all other sources of supply were cut off by means of detectives, so that all beef brought into market was completely under the control of the board. As it was stated that a large quantity of diseased beef had been sold for consumption before this time (which I do not believe was the case), I directed the sanitary inspectors of the different wards to investigate the matter and report to me, with as little delay as possible, whether the consumption of this beef caused any injurious effect upon the health of the city or not. In not a single instance did they report any direct results arising from the consumption of beef, nor did I see or learn of but one case where such was the result. That some diseased beef was sold, prior to this time, is undoubtedly true; but whether it was the cause of diarrhœa, I am not prepared to state, as it was at such a time of the year when diseases of that character prevail, owing to high temperature, etc., and with us, particularly to the want of drainage in certain parts of the city. If such had been the case, diarrhœa would have suddenly increased, and after the supply of diseased beef was cut off, it would have necessarily diminished; but such was not the fact. Then again, owing to the general feeling of distrust for a short time, but little beef was consumed; this also caused no perceptible change in diseases of this character.

Dr. Johns, of Illinois—Mr. President, I move that Mr. Brown, of Jacksonville, a brother of the late Captain Brown, whom we all knew by reputation, if not personally, be requested to address the convention, for, though not a member of this body, he has had a great deal of experience in cattle-raising.

The motion prevailed.

Mr. Brown—Mr. President and gentlemen of the convention, I am happy to be able to state whatever I may know, to gentlemen of intelligence and experience, who seem to be in good faith considering carefully the subject matter before them. The questions submitted to this convention are, in my humble judgment, of great magnitude, appertaining not simply to a few states, but assuming national, international and continental proportions, thereby rendering the responsibility with which you are invested, one of no ordinary character. I will endeavor, gentlemen, to talk plainly, and to the points that seem to me worthy of consideration, in view of the action contemplated by this convention. I am highly gratified that the investigations in regard to the causes, character, and in short, everything pertaining to this disease have been carried so far. But, it seems to me that while these are exceedingly important, the time has come when some proper regulations should be at once adopted under which the vast cattle interests of this country may be conducted in accordance with suitable sanitary regulations.

To come, then, immediately to the subject matter. The first point to which I wish to call your attention, is this: It seems to be conceded on all hands that this disease is communicated to "home" cattle (and I use that term as embracing all cattle except those brought from Texas), though grazing where Texas cattle have grazed before them. I am just as well satisfied, too, that this disease is communicated as well by cattle that come by the way of Abilene, as by those that come up the Mississippi river, or any other route—when the grounds upon which they have fed, are in turn cropped by other cattle—as I am that this convention is now in session before me. I will give you a little of my own experience in handling these cattle; for, though I do not reside upon a farm, I have, whilst a citizen of Illinois, been a greater part of the time concerned in the management of cattle. Early in July last, or about the last of June, we purchased at St. Louis two hundred head of cattle, brought from Abilene by

Mr. Gregory, of Greene county. They were forwarded, by railroad, to our station, some eight miles south of Jacksonville, and about ninety of them were placed on a couple of farms in that neighborhood, for the purpose of being grazed, as we did not wish them upon the same farms with our native cattle. One hundred and eleven of this same lot I took to a farm which I owned, adjoining Jacksonville, and placed them in an inclosure fronting upon the street, but separated from it by a common rough-and-ready fence. The milch cows of the town grazed right along in front of that tract, and of another lying a little west of me, belonging to Mr. Alexander. Those cattle remained in that pasture about a month, when we removed them to another, on the northern part of the farm, where they were in contiguity with the neighboring cattle on the north, outside of the inclosure; while in the front of the pasture, there were a few head of milch cows grazing. After these two pastures had been exhausted, we rented of Mr. Alexander a strip of ground, fronting on a street running on the west side of his land; which land, in turn, fronted upon the same street in which I grazed the cattle in the first instance. Those cattle all remained healthy, although thus exposed to the public roads adjoining the city of Jacksonville, where foreign cows were continually passing along. The same is true of the cattle grazed eight or ten miles below Jacksonville. These facts, connected with innumerable others, together with those reports submitted by Dr. Johns and my brother, go to show that it is (I will not say impossible) not at all probable that the cattle inside of an inclosure will communicate this disease to those outside. Though an extremely rare case may happen to the contrary, it seems to me that for the purpose of our ordinary business transactions, we may regard that proposition as true.

I believe that I will so far trespass upon your patience as to read to you, upon this subject, a portion of a letter written by a gentleman in Missouri, who has had a great deal of experience regarding this particular point. It is as follows: "Without troubling you with details, I will first state to you the conclusions to which I have arrived. First, and most important, how is the disease communicated? Beyond a doubt, from contact; or rather from feeding or watering with or after Texas cattle, as I have never yet known a case that could not be traced directly to those causes; nor have I known a case in which the disease was com-

municated when a fence intervened between the healthy and affected stock. I have had my own cattle separated from large herds of Texas cattle only by a fence, without any evil results. And of the immense number that have died on this road, none have died on pastures from which Texas cattle have been excluded. The instances to substantiate this view are so numerous, that I will not undertake to enumerate them. My own opinion is, that the poison is taken from the stomach," etc. Then he goes on to state his theory about the disease. That is what Mr. Chisholm has to say about the matter. I have not had a case, myself, since adopting this plan, though tens of thousands of Texas cattle have passed my door.

If it be true, gentlemen, that cattle thus isolated in this simple manner do not communicate the disease, what next? Is this disease communicated by bringing these upon the railroad? On the cars that run from Kansas City to Quincy and Alexander, home cattle were transported in them one day, and Texas cattle the next, if the car got back so quick. If I am correctly informed (and I confidently believe I am), not a single home steer has been contaminated by being transported in that manner. I believe I am warranted in saying this is true. And if it be, bearing in mind the fact that thousands and thousands of cattle have been shipped over this road this season, where is the danger of shipping Abilene cattle into Illinois, or any other portion of this great northwest? And when they have grazed upon our pastures, and fattened upon our corn, where is the danger of taking them to New York and feeding the poor of that city upon them? If Texas cattle are excluded from that market, then the lower classes must do without their beef, because the price of it will be so enormous that the poor man cannot afford to buy it. Therefore, this question is not one simply of interest to the farmers of the west, and to the people of Texas, with their millions of cattle; but involves, as well, the sustenance of the working classes of the eastern and northern cities, who as much deserve the consideration of this convention as those who can eat beef irrespective of the price.

Allow me to allude to another point just here, for fear I may forget it. Is it true that there is any danger of domiciling this cattle disease in Illinois, or any part of our northern country, through these spores? Is there any danger? If there be, we,

who live in Illinois, are most deeply and vitally interested; and it behooves us to be on the alert, lest we be involved in it. I imagine, however, that this theory is not practically true, and I will present one or two reasons why it seems to me that it is not.

In the first place, for twenty years, except during the war, I have been, to a greater or less extent, handling these Texas cattle in Illinois. Is there any man who, during that time, has ever known of the cattle disease being communicated to a single animal in the spring following the summer and fall, during which Texas cattle have been grazed upon those lands? I don't believe that a single man can be found who will even intimate that.

Again, in regard to a paper read this morning by the gentleman from Missouri (Mr. Smith); and, also, with regard to a conversation which I had, the other day, with a representative from the southwestern part of that state (Mr. Moore.) It was stated both in that paper and by the gentleman, as I understood, that during the war there was no Texas cattle fever in southwest Missouri. I believe the gentleman, also, concurred in the belief, that after winter had intervened there was no danger.

Mr. Moore, of Missouri—I beg your pardon, sir; that is not my opinion. All the information that I have upon that subject goes to show that the winter does not kill the disease.

Mr. Brown—I am glad to be corrected, sir. If I understood the report read this morning, it stated that during the war (which occupied at least four years) there was no Texas cattle fever in southwest Missouri, for the reason that no Texas cattle were brought there.

Now, if this disease can be communicated in the manner stated by the theory I have just alluded to, would not it have been likely to have appeared? Will the gentleman be kind enough to state how it is, that if the disease may be propagated as he supposes, it was not, in fact, disseminated during those four years of war.

Now, gentlemen, it seems to me that, taking all these points together, we have information enough to enable us to adopt some simple, just and equitable measures, easy to be understood and easy to be inforced, in relation to this disease. Suppose that during the months in which this disease is liable to be communicated (giving the widest margin), Texas cattle be excluded—say from the last of March to the first of October, until the frost comes—then permitting them to come in—holding every man responsible

for any damage that may result from the infaction of the law into which this measure is proposed to be enacted.

THE PRESIDENT—I would like to ask you, sir, if killing frosts occur in this section until about the first of November?

MR. BROWN—I am not very familiar with that subject, Mr. President; but I believe that, although some seasons are warmer than others, the weather is by that time suffiiciently cool to, with proper safeguards and restrictions, allow of these cattle being brought in.

Two or three other brief remarks, gentlemen, and I am done. As was remarked by the gentleman from Kansas (Mr. McCoy) yesterday, Texas is an immense empire, capable of being divided into four states, as provided, whenever the proper time shall come. It contains millions of cattle, which, with proper regulations, can be brought into Kansas, Nebraska, Iowa, Missouri, Illinois, and other sections of the country, and consume the grass and corn which otherwise would be comparatively worthless. Unless they can be allowed to do that, we shall be simply doing a small business in home cattle, that will hardly afford our farmers a decent rent for the lands upon which the cattle are grazed. There are exceedingly few, right here in the center of this great cattle region, who have gained a fair compensation for their grass and corn simply by handling home cattle; and I venture to say that this very year, some of the most careful men in Morgan county will lose money in carrying on that business, for the simple reason that I have stated.

DR. CORSON, of Pennsylvania—Will the gentleman be kind enough to explain, Mr. President, why prices should be so low that no money can be made if Texas cattle should be excluded?

MR. BROWN—Prices of home cattle will be higher if you exclude Texas cattle.

DR. CORSON—I understood you to say that farmers could not raise home cattle enough to consume the grass and corn?

MR. BROWN—They would be able to do so in a limited way, but the revenue would be proportionably lost, unless they could realize what I suppose they could not—famine prices.

DR. CORSON—Would it not be rather because they could not send the necessary number?

MR. BROWN—Precisely—they could not raise them.

MR. EARL, of Indiana—Are not these your views, sir: that it would be impossible for the farmers of the west to raise calves and send them forward as stock, so as to make it profitable?

MR. BROWN—Precisely.

One word more. I believe it is conceded that when these Texas cattle leave our western farms—go to the eastern markets and are slaughtered—they make good, wholesome food.

And if that be so, why is it, I ask, in the name of reason, common sense and humanity, that they are to be excluded? The good God made them for some wise purpose. He did not constitute that vast domain so admirably adapted to the raising of cattle, that they might merely reproduce themselves and die, generation after generation. He made them for the use of man; and now, when we may safely make use of these animals to the great benefit of the western people, through the consumption of their grass and grain, and benefit just as much the eastern people by giving them good healthy beef, at prices which they can afford to pay—how can any one argue that this great traffic should not be allowed to go on, under suitable restrictions?

MR. POOLE, of Indiana—Mr. President, I wish to make one remark; not only in justice to myself, but to the state board of Indiana, the people of that state, and to its governor, who kindly sent me a letter requesting me to come here.

I am here as one of the commissioners of that state. I had no intention of saying one word that was not true, and have made no statement here that is not a fact. That being the case, I do not feel as though I had been treated exactly right when gentlemen rise here with positive assertions and statements, and undertake to show distinctly that what they say is so, and that what I have said is false.

Now, sir, I stated yesterday that this disease had been contracted by cattle that were never outside of a field that Texas cattle had never been inside of. And I stand here ready to substantiate that testimony by the evidence of as good men as there are in Indiana or Illinois—of the men, themselves, who owned the cattle, who will swear, positively, that what I stated was true.

MR. BROWN—One word, if you please, Mr. President. I did not intend to question the truthfulness of the gentleman's statement; but, as I recollect it, it was extremely doubtful whether

the disease was, or was not the result of communication between the cattle. I positively disclaim all intention of discourtesy.

Mr. Christie, of Canada—Mr. President, the matter in regard to which this little conversation has just taken place, is a very important one; and for the sake of clearing it up beyond all controversy, I wish to refer to a fact which come under the observation of the Canadian commissioners, and which occurred in this state during the month of August last.

In the Illinois correspondence of the *Country Gentleman*, date of 13th of August, it is stated: "In the town of Tolono lives a Mr. Larmon, a very pains-taking and hard working man. His cows are fenced within his lot, and this is watered from a well three times a day. His cows were divided from the open prairie and the Texas and native cattle by a common board fence only; yet he has neither lost an animal, nor have they been in any way affected."

I will now read to the convention Mr. Larmon's own statement, premising, by the way, that on visiting Tolono, there was not, and never had been a man there by the name of Lawrence, and that the name of the gentleman in question was Isaac Larmon. His narrative, under his own signature, is as follows: "My two cows have been grazing in an inclosure adjoining the prairie where the southern cattle graze, only separated from them by a common board fence. I attended to my cattle regularly, three times a day, until about ten days ago. I supposed them exempt from the disease. About that time, one of them showed symptoms of illness, and died after three days' sickness. The other became sick; and it is my opinion that she is in the last stage of the disease.

I am of the opinion that my cows got the infection from the Texas cattle. I have seen the Texas cattle dying in great numbers, apparently of the same disease, having the same symptoms. There is no one in the town of Tolono, within my knowledge, of the name of Lawrence, as mentioned by 'B. F. G.' in the *Country Gentleman*."

I may state that when we called upon Mr. Larmon, he told us he left the last of his cows for dead that morning, and that she was then lying in the ditch. We found her there, still alive, and dragged her out by means of some ropes. She was able to get

on her feet, but was in a very weak condition, being in the last stages of the disease, and died the next day.

Here, then, is a case beyond all controversy—the very case which has been referred to as positive proof that cattle could not contract the disease when protected by a common board fence—establishing the fact that such protection is not sufficient.

Dr. Clendennin, of Ohio—Mr. President, I have heard with a great deal of pleasure the results of microscopic examinations which have been detailed to us by several members, which I believe to be extremely important to the correct understanding of the nature of this disease. In relation to them I wish to make one remark.

There seems to be one link, at least, wanting in the chain of evidence with reference to these spores, and that is what produces this disease in cattle in Texas, and to what extent does it there prevail?

If I understand correctly the statement of the gentleman from New York (Mr. Morris), these spores originate among the native grasses of Texas, are brought hither by the Texas cattle, and by them disseminated. Now, if that be so, then comes this question: is the disease much more prevalent there than it is here? The ascertaining of that fact is, it seems to me, the starting point.

In reference to this doctrine of spores producing disease, we have conflicting opinions. In the early part of the war, measles were generally very prevalent throughout the army. One medical gentleman attributed the disease to a particular kind of a spore or cryptogamous plant, which was always found, he said, in straw. But it is well known to all of us that straw was very rarely found in the front, where measles prevailed to a very considerable extent.

Professor Mitchell, of Philadelphia, published as early as 1846, I think, a little book, in which he claimed that we had, in this doctrine of spores, an explanation of causes of the potato rot, cholera, yellow fever, intermittent and remittent fever. There certainly are some points connected with the statements made to-day, with relation to the development of these spores, which, it seems to me, are not fully elaborated, but what I wish to know just now is, whether there is any gentleman present who can give us any information regarding the prevalence of this disease in Texas.

MR. PIPER, of Illinois—Mr. President, a notice has been handed to me by a gentleman largely interested in cattle-raising in this county, and which I wish to read to the convention. There is a gentleman present who can explain it.

It is as follows: "I understand that E. R. Ulrich and Wilson, wintered some Texas cattle in Kansas last winter; that some of them were kept on hand until summer, and communicated the disease to other cattle."

Mr. Ulrich is in the house, I see, and can tell us whether that is the fact.

I would suggest, Mr. President, as no invitation has been given to cattle-dealers generally (and there are very many of large experience who are attending our deliberations, and are much interested therein) to give us their views on this subject of Texas cattle, they be respectfully requested to do so.

The motion prevailed.

MR. HOWARD, of Michigan—Mr. President, there are one or two doubtful points, in the subject under consideration, so very important that it seems to me they should be more fully elucidated than they have yet been. One of these is: whether it is possible that the disease may continue through the winter and be propagated the following season—and in regard to that, some gentlemen have stated that they could give us information.

It seems to me that we had better use as much method as possible, and first clear up these doubtful points—especially those in regard to the source of the disease, and whether it can be continued through and propagated after a winter.

MR. BARRETT, of Missouri—It seems to me, Mr. President, that we have consumed a good deal of time in speech-making, which has elucidated comparatively few facts, and in order that members may feel the necessity of expressing themselves briefly, and to the point, I offer the following resolution:

Resolved, That members of this convention and others who may be invited to address us, shall not consume more than ten minutes at a time, in the discussion of any subject.

The resolution prevailed.

MR. PIPER, of Illinois—I move, Mr. President, Mr. Ulrich be invited to give us an explanation of the note which I have just read.

The motion prevailed.

MR. ULRICH—I accept your invitation, Mr. President, and the explanation is as follows: We sent to Kansas two shipments of blooded cattle from this county (perhaps in all fifty or sixty head), the first lot being shipped last winter, and the last some time in May, I think, of this season.

Mr. Wilson, in November last, I think, bought there six Texas cows, who ran on the prairie with these native cattle. Besides that, I had a herd of some three hundred cattle, that once in a while would get on the same ground with these cows.

In July, Mr. Wilson wrote me that one or two of these blooded cows, sent out in May, had died, and that one or two more were sick. He is here himself, I believe, and can state exactly the number of cows we lost, but I don't think there were more than four out of the whole fifty or sixty, and none of my native steers running there died at all.

I cannot entertain the idea that these six Texas cattle were responsible for those deaths. That is more than I am able to understand, because if they gave the disease to part, why should they not to all? It seems to me, that these three, four or five cows, having just been shipped out there, very likely died while undergoing acclimation, for if the Texas cattle communicated the disease to them, it does seem as if they must have communicated it to hundreds of others with whom they came in contact.

MR. CHRISTIE, of Canada—Allow me to ask you, sir, in what part of Kansas did this occur?

MR. ULRICH—Twelve miles northeast from Topeka, sir.

MR. MORRIS, of New York—Mr. President, in explanation of the remark of the gentleman from Ohio (Mr. Clendennin), I would simply remark that it is a well-known fact among botanists, that this microscopic cryptogam does grow upon bottom lands in warm latitudes.

Another point that I omitted to mention is: that these spores are found only in the blood of Texas animals, either sick or well, or in the blood of sick native animals. They never yet have been found in the blood of healthy native animals.

THE PRESIDENT—With your permission, gentlemen, I will call upon Mr. Hill, of Illinois, to give us some information on the subject.

[Certainly, certainly, let us hear from him.]

Mr. Hill—Mr. President and gentlemen of the convention, the citizens of our township (Tolono), who have been the greatest sufferers in the state of Illinois, have sent me here to make a representation of their case, if permitted to do so, and to entreat you that your measures might so be shaped as to grant us, if not relief for the past, yet security for the future.

Our little town is situated, as you are aware, at the crossing of the Great Western, and the Chicago branch of the Illinois Central. Great preparations were made there last spring by the Illinois Central Railroad, and many thousand dollars expended in building fine cattle-pens and barns, which, although the road denied it, we supposed were intended (as the fact turned out to be) for the purpose of facilitating the importation of these Texas cattle. The first train containing any arrived on the 29th of last April, and they continued to come until late in the summer. About the 10th of June, the cattle disease broke out and continued to rage as long as there was material for it to work upon, until nearly all of our cattle fell a prey to it. Among the few left, the disease still continues to work, one gentleman having lost some five steers only last week. On the 5th day of September, within two miles of the town, I think there were but two milch cows left, and up to that time seven hundred and seventy-six cattle had died in that little township, which polls but a trifle over two hundred votes, since which time two hundred more have died.

Some facts have been stated in regard to Mr. Larmon's cattle, and the disease not being communicated to them across a fence. As I am a near neighbor of his, I will just state what I know about that. His cows were among the last that died, but they did die, notwithstanding that they were inclosed, I think, by a common five-plank fence.

Our loss has not only been very great, but has borne very hardly upon us, as a large portion of our population consists of foreigners, who have kept one, two and three cows, the milk and butter of which constituted the chief support of their families. Having lost their stock, they are unable to buy any more.

The gentleman (Mr. Brown) argued very strongly, a few moments ago, in favor of bringing in and raising Texas cattle here, for the reason, as he asserted, that there is no profit in raising home cattle. I would like to know if the cattle raisers of this country did not make money before Texas cattle were imported. They

certainly did, and most of them got rich upon the profits of native cattle raising; and so it would be now, if these Texas cattle were not brought in. Many a small farmer has purchased his farm, expecting to pay for it by raising home cattle. We have many such instances in our country, where men had fifty, sixty or seventy head of cattle, which they expected to sell this fall, and thereby pay for their places. But having lost their stock, their farms must go, and they themselves be reduced to poverty.

Not only have our cattle been thus destroyed, but our horses are now dying from this same disease, a number having died this last week with precisely the same symptoms, in every respect, as those of the Texas cattle fever. We are, sir, now deprived of our cattle, and if our horses are taken away, what must become of our country? It must return to its native wildness, and become a wilderness. You can hardly find a man in Tolono who is not desirous of selling his farm and leaving that section. A great many have sold out, many others say they will be obliged to if these cattle are still brought in as they have been; and thus the whole of that portion of the state may become depopulated.

The argument in favor of importing these Texas cattle, in order that certain parties may profit thereby, reminds me very strongly of the old fable of the boy and the frogs. It is all very nice, as far as they are concerned, for a few cattle dealers to flood the country with these Texas cattle, and enrich themselves, but it is death to the inhabitants, who not only have lost their cattle, but who must pay taxes on them notwithstanding, that is, they must, according to law; but our people are not able to do that, and the taxes cannot be collected. The farmers of our section are driven to desperation, and I will say to the gentlemen here who argue in favor of bringing in Texas cattle as a means of cheapening beef, that if any body brings any more Texas cattle into our region, their meat will be very cheap there, just as sure as you are born. This is the state of feeling there, and has been for the last three months. It has been all that the conservative and law-abiding citizens could do to prevent the tearing up of the railroad and the killing of the cattle brought there, and if more are sent, it will be impossible to any longer restrain mob law, much as that is to be deprecated.

Great as is the necessity of supplying the New York market, we must look at what we are to do at home. I ask this honorable convention whether the people would rather do without Texas beef

or without milk and butter, for you must dispense either with the Texas cattle, or with those staples. We have not had any milk in Tolono, that is, none to speak of, since last July, and where butter used to be ten or twelve cents a pound, it is now forty-five and fifty, it being impossible, half of the time, to get any for love or money.

THE PRESIDENT—The gentleman's time is up. Will the convention extend it?

[Certainly, certainly.]

MR. HILL—Thank you, Mr. President and gentlemen. As regards the argument that these Texas cattle should be brought in, in order that certain men may reap the profit, and that eastern markets may be supplied with cheap beef, it seems to me that for the same reasons, you might as well break down the manufacturing interests of the United States in order that England may flood us with cheap goods, and that importers may grow rich thereby.

MR. GOULD, of New York—If the gentleman will pardon the interruption, I should like to ask him how many milch cows are now left in Tolono?

MR. HILL—Only two.

MR. GOULD—Be good enough to tell us how many you had before the disease appeared.

MR. HILL—I should think at least four hundred and fifty, sir.

MR. GOULD—Has there ever been any examination made of those horses which are said to have died of the Spanish fever, and if not, please state what the external symptoms were.

MR. HILL—I don't think there has been any scientific examination, sir. The external symptoms were drooping of the head, roughness of the coat, rounding up of the back, and weakness across the loins; finally, the animal sinks down and dies.

MR. GOULD—Did you observe any bloody water?

MR. HILL—I never examined that, but there is a yellow mucus exuding from the nose and mouth, accompanied by drooling, as in the cattle disease.

MR. GOULD—Are there frothy air-bubbles in the mucus of the mouth?

MR. HILL—Yes, sir.

MR. GOULD—No bloody water has ever been generally observed?

MR. HILL—I think not.

MR. GOULD—What is the condition of the stools?

MR. HILL—Dry and hard.

MR. GOULD—Is that invariably so?

MR. HILL—I think it is; nearly so.

MR. GOULD—Have you ever observed anything with regard to the odor of the sick animal and the healthy?

MR. HILL—There is a very noisome smell of both. A day or two before they die there is a moisture, almost like grease, on the tongue, which smells very badly.

MR. GOULD—Has there ever been any attempt to measure the temperature of the animal when sick?

MR. HILL—I think not, sir.

MR. GOULD—How many horses have died, as near as you can recollect?

MR. HILL—I think, seven or eight at first, and four or five since; some of which have died within the last two or three weeks, and some four weeks ago. Several horses died earlier than that; but not thinking that this disease would affect the horses, no particular attention was paid to that at the time.

MR. GOULD—Did these sick horses have any peculiar expression of the eye?

MR. HILL—Yes, sir; the same expression that cattle have, as near as a horse can look like a creature.

MR. GOULD—Have any mules died with this disease, sir?

MR. HILL—There are considerable many employed about there, but I don't think that there have—never heard of any. I can give you the names of those who have lost horses, and you can communicate with them.

DR. KILE, of Illinois—You stated, I think, sir, that cases had occurred where Texas cattle outside of a fence had communicated the disease to cattle within the inclosure?

MR. HILL—I only know certainly of one case. I would not hazard an assertion, but I think other cases have occurred.

MR. THAYER, of Massachusetts—I understood you to say, sir, I believe, in relation to the discharges from the nose and mouth, that they were both of a yellowish color?

Mr. HILL—Yes, sir.

MR. THAYER—Alike from both?

MR. HILL—Yes, sir.

MR. THAYER—How was the respiration—hot?

MR. HILL—Hot and difficult—just before death.

MR. THAYER—How was it in the first stages; or rather I will ask you, how long did the disease continue before death ensued?

MR. HILL—They died in not more than from three to four days after we discovered that they were diseased.

MR. THAYER—One more question, if you please. Do you know whether the horses lay down any during the sickness?

MR. HILL—I cannot answer.

MR. GOULD, of New York—Was there any cough, sir?

MR. HILL—No, sir; none more than natural. It was nothing like the cough of a horse afflicted with the horse-distemper, or anything of that kind.

MR. STOCKDALE, of Ohio—Allow me to ask you, sir, if any young calves still sucking, died?

MR. HILL—Yes, sir; considerable many calves died, but not nearly so many of them as of the old creatures. A good many sucking calves did die; but sometimes the cow would die and the calf would suck until death and yet not die.

MR. POOLE, of Indiana—Let me trouble you with one question, sir. Might not those calves have died from want of nourishment and care, whether there was any disease or not?

MR. HILL—I don't think that was the case, sir; for there was so much good feed that a calf a month or six weeks old could have subsisted very well. There might have been, and probably were, some very young ones that died from these causes; but some of them presented all the symptoms, and undoubtedly died of this disease.

MR. GOULD, of New York—Can you tell us, sir, whether the animals who imported the disease came from Texas by way of the river, or from Abilene?

MR. HILL—They came on the railroad from Cairo, and I should suppose by boat from the Red River to that place. Mr. Eaton can answer the question.

MR. GOULD—Will Mr. Eaton be kind enough to answer that question?

MR. EATON—My impression is that all of the cattle unloaded at Tolona came by way of the river; at least I am not aware that any came by way of Abilene.

Dr. Rauch, of Illinois—Will you be kind enough to tell us, Mr. Hill, if any cows have died recently in the neighborhood of Tolono.

Mr. Hill—Yes, sir, some have; after our cows had all died out some eight or ten were brought from Edgar county, I think. It was stated that they had never been exposed to the Texas cattle ranges, excepting as it was necessary for them to cross where Texas cattle had been driven. They were sold in our place, and part of them have died.

The President—Were those native cattle, sir?

Mr. Hill—Yes, sir, brought there four or five weeks ago.

Dr. Rauch, of Illinois—How soon did they die, sir, after being brought to your place?

Mr. Hill—In about three weeks. They were brought there four or five weeks since, and some of them died ten days ago. Cattle are dying there yet. One gentleman lost seventy previous to the 15th of November, and when the disease broke out again last week he lost three fine steers of those few that were left over from the first.

Dr. Rauch—Had there been any frost at Tolono?

Mr. Hill—Yes, sir; both frost and snow.

Dr. Rauch—Is it certain that the animals were not exposed to the influence of the Texas cattle before being brought there?

Mr. Hill—I am only able to state on the responsibility of the gentleman who brought them there.

Mr. Earl, of Indiana—Allow me to ask you, sir, if there have been any late importations of Texas cattle, say since September, that may have imparted this disease, or was it caused by the cattle that came in in June and July?

Mr. Hill—It was from cattle that came in in June and July.

Mr. Christie, of Canada—Another question, if you please, Mr. Hill. You say that some steers have recently died?

Mr. Hill—Yes, sir; and a number from an importation of native cattle.

Mr. Christie—Were those steers at Tolono during the season, or have they been imported since?

Mr. Hill—They were near Tolono, on a farm, all the summer, sir. Seventy died previous to the 15th of September; eight or ten of the same head escaped then, three of which died last week.

Mr. Christie—Then they were in contact with the diseased native cattle of the same herd?

MR. HILL—Yes, sir; and of the ground on which Texas cattle had died.

MR. CHRISTIE—That shows the second period of incubation.

DR. MILES, of Michigan—I should like to know the facts, Mr. President, in regard to the communication of this disease after the winter has elapsed. The gentleman from Missouri (Mr. Moore) can enlighten us, I believe.

MR. MOORE, of Missouri—What I have to state, Mr. President and gentlemen, in relation to the question is simply this. Some freighters about to cross the plains selected native and Texas cattle, herded them and fed them together during the winter, made up their teams in the spring, and started across the plains with all their animals apparently well. When they had got half way across the plains, the native cattle were all dead, and the Texas cattle were left to make the journey alone. Those are the facts as communicated to me by a gentleman who was with the train and knew all about it.

DR. MILES, of Michigan—Were these animals obliged to pass over the trail of Texas cattle, do you know sir?

MR. MOORE—There were no trains, except the oxen, going that way—that is all I know in that particular. I am perfectly familiar with the Spanish fever among horses, as I have had many afflicted with it while in Texas. The horses have it more there than the cattle, and they are not considered of hardly any value after having been troubled with it—and they seldom do recover so as to be of any use.

DR. CORSON, of Pennsylvania—Will you be kind enough to tell us, sir, whether the Texas cattle have the fever in Texas. A gentleman informed me yesterday that they did not.

MR. MOORE—I very seldom saw a case there, sir, among them, and I resided there six years, though I have seen very many horses have it there.

DR. THAYER, of Massachusetts—I should like to ask you, sir, whether the symptoms of the disease called Spanish fever, among horses in Texas, are the same as the symptoms of that fever, so called, among cattle in Missouri?

MR. MOORE—Yes, sir; it is looked upon as the same thing, and I think they are the same exactly.

MR. BARRETT, of Missouri—Mr. President and gentlemen, in 1866 I started from St. Louis to go to Texas. Having but a short

time to make the trip, I selected what I thought was the best horse I ever saw—I think I averaged forty-five to fifty miles a day. On getting about to the south-western part of Missouri, I found the corn worm-eaten, and little or no hay, so that I was compelled to graze him in the daytime. The morning following my arriving in Texas my horse was taken sick, with very much the same symptoms that have been described here as belonging to the Texas cattle fever, and was told there that my horse had it.

I offer this information in corroboration of the fact that horses do die of that fever when taken to that country.

Mr. McCoy, of Kansas—Mr. President, when the first reports reached us at the west regarding cattle dying of Spanish fever in Illinois, there were then at Abilene between thirty-five and forty thousand cattle, and probably some six hundred persons attending upon them. I made it a point to inquire diligently among all these drovers, cattle-holders, etc., who were perfectly familiar with the whole subject, whether in the state of Texas they had anything like the Spanish fever among the cattle there. And I state as matter of fact to this convention, that I never yet found one single man who had ever seen or heard in that state of one case of Spanish fever among the cattle; but they all said it was frequent among the horses. Furthermore, that a horse was worthless after having had it—of no account at all.

It has occurred to me repeatedly, during the sessionof this convention, that we should ascertain beyond all question whether or not this disease does exist among cattle in Texas; and should also find out, beyond all possibility of doubt, what are the roots or seeds of this disease. It seems to me that there is where we must commence our investigations in order to arrive at a correct conclusion. We have not yet been able to ascertain, to our own satisfaction, the point from which it originates. The furthest southwest that we can trace it, is southwestern Missouri and southern Kansas; for I have, at least, yet to hear of a case in the Indian country.

Mr. Barrett, of Missouri—Did you ever hear, sir, of a case of our native cattle being taken from the states to Texas, and there dying of the Texas fever?

Mr. McCoy—Well, sir, I have made some inquiries upon that subject, of drovers bringing cattle from the central and southern part of Texas, why they did not come north and procure the

means of improving their stock, and make it as good as the stock in northern Texas. Many of them would state that their stock was so near worthless—there being no market—that it would not pay for them to take that trouble. Others would say that such and such a one had tried that, but the imported animals had died. But Durham stock has been successfully taken from this state, and have very much improved the native stock of the northwestern portion of Texas, so that to-day, cattle coming from the north or northwestern portion of that state are as radically different in appearance from those of the lower counties, as the improved Durham is from the Southdown. The difference is so marked that whenever a drove of Texas cattle arrive in any market, well posted men can readily tell what section of the country it comes from.

Mr. Barrett, of Missouri—Will you be kind enough, sir, to answer my question a little more fully?

Mr. McCoy—I stated, sir, that the native cattle taken into the southern and central portion of Texas, for the purpose of improving the stock, died as I am told. Whether they died of this cattle disease, or in consequence of being transported there, I am unable to say; but I do say that into the northern portion of Texas the importation of Durham stock has been so successful as to radically change the cattle of that section of the country.

Dr. Clendennin, of Ohio—I wish, Mr. President, to make one statement. It may not be known to some members of the convention, that in the agricultural report issued from Washington in 1860, there is a very full history of attempts made to propagate, in Texas cattle, from the northwestern states.

Dr. Johns, of Illinois—I move, Mr. President, that the convention will now adjourn to half past seven o'clock this evening.

The motion prevailed.

—

EVENING SESSION.

The convention met pursuant to adjournment.

Mr. Gould, of New York—Mr. President, I have the honor to submit the following report from the committee appointed at a preceding session, for the purpose of drafting certain propositions

relative to this cattle disease, which might be enacted into laws by the legislatures of the respective states:

The convention of American Cattle Commissioners, assembled at Springfield, Illinois, respectfully recommend to the several states represented therein, to give effect by legal enactments to the following general propositions which are believed by the convention, to embody principles which are of the greatest importance; not only for the welfare of the cattle interests, but for the security of the people themselves.

I. Commissioners and Assistant Commissioners.

1. Three commissioners, or such other number as the legislature shall deem proper, shall be appointed by some competent authority, to hold their offices for five years, and shall report annually to the legislature.

2. Such commissioners shall watch over the general welfare of cattle within the state for which they are appointed, and particularly for the purpose of preventing the spread of dangerous diseases among them, and of protecting the people of the state against the danger arising from the consumption of diseased meat.

3. They may from time to time appoint such assistant commissioners, to aid them in the discharge of these duties, as the welfare of the public may require.

4. They should have power to administer oath, and to prescribe from time to time such rules and regulations as may be necessary to accomplish the objects of their appointment.

5. They shall give public notice of the outbreak of any dangerous disease, and such practical directions for its avoidance as they may deem necessary.

6. They may either place such diseased animals in quarantine, or cause them to be killed, as may seem necessary for the public protection; but in the latter case, they shall cause an appraisal of such animals to be made, and the county or state shall pay such proportion of the appraised value as may be provided by law.

II. Railroad.

1. The commissioners, or any assistant commissioners located on the frontier of the state, shall, at such time as may be prescribed by the commissioners, have power to inspect all the cattle brought into such state, whether by railroad, vessels and common roads; and shall have power to detain such railroad cars, vessels, and droves or animals on common roads, long enough to make a proper inspection of them for the purpose of ascertaining their sanitary condition.

2. No animal shall be permitted to enter the state which shall be deemed by such assistant commissioners to be capable of diffusing dangerous diseases, or of injuring the health of the inhabitants.

3. No train shall be allowed to proceed, unless the animals contained therein have been supplied with food, water and rest, within twenty-four hours next preceding the time of such inspection.

4. All animals shall rest and have access to food and water for twenty-four hours after having traveled for a similar period.

5. The railroad companies shall provide suitable yards for feeding, watering, and resting the animals traveling on the train, and for quarantine purposes, which shall be kept in a cleanly and wholesome condition, to the satisfaction of the commissioners.

6. Each train, on leaving its point of departure, shall have a certificate, signed by an assistant commissioner, which shall certify that all the animals therein were in a healthy condition at the time of its departure, and also, the exact time of its leaving; and such certificates and indorsements thereon of the time of resting and the time of departure of the train, at subsequent resting and feeding places, shall be exhibited to the proper authority whenever required.

7. Proper penalties should be inserted to prevent the bribing of officers charged with the execution of these provisions.

8. Proper penalties should also be provided for those who interfere with, or resist the officers charged with the execution of these provisions.

III. Preamble and Resolutions.

Whereas, A malignant disease among cattle, known as Spanish Fever, has been widely disseminated by the transit of Texas and other southern cattle through the western and northwestern states, during the warm season of the year, occasioning great loss to our farmers, and possibly endangering the health of our citizens therein,

Resolved, That this convention earnestly recommend the enactment of stringent laws to prevent the transit through these states of Texan or Cherokee cattle, from the first day of April to the last day of October, inclusive.

Resolved, That the interests of the community require the enactment of laws making any person responsible for all damages that may result from the diffusion of any dangerous disease from animals in his ownership or possession.

All of which is respectfully submitted.

I would like, Mr. President, and gentlemen, to say this much in explanation of the report: it was utterly impossible to make it in the form of specific enactments, for the reason that the local governments of the different states vary to so great an extent.

For example, the state of Rhode Island has no county government whatever, and duties imposed by law on county officers would find no officers there to fulfill them; and so, in various other ways, it is found that the different constitutions of the states prevented any uniform enactment. The committee, therefore, decided to present their report in the form of general propositions, to be submitted to the various legislatures, to be reduced to form by those legislatures, in accordance with their respective powers.

Mr. PIPER, of Illinois—I move, Mr. President, that the report be received.

The motion prevailed.

Dr. MORSE, of Missouri—Mr. President, for the purpose of giving all, who may desire, an opportunity of saying something on these propositions, I offer the following resolution, and move its adoption:

Resolved, That in the discussion of this report, members be limited in their speeches to five minutes time, unless, by consent of the convention, that time is extended.

Mr. HAMILTON, of Pennsylvania—I move, sir, to amend by striking out "five," before minutes, and inserting "ten".

Dr. MORSE—I accept that amendment, Mr. President, and renew my motion.

The motion prevailed.

Mr. POOLE, of Indiana—I move, Mr. President, that we take up the propositions offered by the committee, *seriatim*.

The motion prevailed.

The secretary read the first proposition, as follows:

1. Three commissioners, or such other number as the legislature may deem proper, shall be appointed by some competent authority, to hold their offices for the term of five years, and shall report annually to their legislature.

Mr. POOLE, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the second proposition, as follows:

2. Such commissioners shall watch over the general welfare of the cattle within the state for which they are appointed, and particularly for the purpose of preventing the spread of dangerous diseases among them, and of protecting the people of the state against the dangers arising from the consumption of diseased meat.

The PRESIDENT—I would suggest that, perhaps, the word "animals would be preferable to "cattle".

Mr. GOULD, of New York—On behalf of the committee, I will accept that suggestion as an amendment, Mr. President.

Mr. POOLE, of Indiana—I move that the proposition be adopted, as amended.

The motion prevailed.

The secretary read the third proposition, as follows:

3. They may, from time to time, appoint such assistant commissioners, to aid them in the discharge of these duties, as the welfare of the public may require.

Mr. Poole, of Indiana—I move, Mr. President, the adoption of that proposition.

The motion prevailed.

The secretary read the fourth proposition, as follows:

4. They should have power to administer oaths, and to prescribe, from time to time, such rules and regulations as may be necessary to accomplish the objects of their appointment.

Mr. Poole, of Indiana—I move the adoption.

The motion prevailed.

The secretary read the fifth proposition, as follows:

5. They shall give the public notice of the outbreak of any dangerous disease, and such practical directions for its avoidance as they may deem necessary.

Mr. Poole, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the sixth proposition, as follows:

6. They may either place such diseased animals in quarantine, or cause them to be killed, as may seem necessary for the public protection; but, in the latter case, they shall cause an appraisal of such animals to be made, and the county or state shall pay such proportion of the appraised value as may be provided by law.

Mr. Poole, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the first proposition, of the second general division, as follows:

1. The commissioners, or any assistant commissioners located in the frontier of the state, shall, at such time as may be prescribed by the commissioners, have power to inspect all the cattle brought into such state, whether by railroads, vessels and common roads, and shall have power to detain such railroad cars, vessels and droves or animals on common roads, long enough to make a proper inspection of them, for the purpose of ascertaining their sanitary condition.

Mr. Poole, of Indiana—I move its adoption, Mr. President.

The motion prevailed.

The secretary read the second proposition, of the second general division, as follows:

2. No animals shall be permitted to enter the state which shall be deemed by such assistant commissioner to be capable of diffusing dangerous diseases, or of injuring the health of the inhabitants.

Mr. REYNOLDS, of Illinois—It strikes me, Mr. President, that one man is, by that section, permitted to exercise a very great authority. It seems to me that provision should be made by which an appeal can be ultimately taken to the decision of the commissioners themselves.

Mr. GOULD, of New York—Allow me to remark, Mr. President, that the committee recognize the full force of the objection made by the gentleman from Illinois (Mr. Reynolds), but it seemed as if we were reduced merely to a choice of evils. If any possible way could be provided by which a council could be held, I should be very much in favor of any proposition looking to the accomplishment of that end; but here is a train coming in, there is no time to stop; the assistant commissioner discovers this disease, and he must either have the power to promptly detain such animals or run the risk of diffusing these horrible cancers, of which I have before spoken, through whole communities.

I suppose that the states will appoint gentlemen of character and responsibility as commissioners, and the only way that I see of obviating the difficulty is by providing for an appeal to them, and giving them power to at once remove any assistant who acts corruptly or viciously.

Mr. REYNOLDS, of Illinois—All I desire, Mr. President, is to devise some means by which, in case of difference of opinion, an appeal may be taken from the assistant commissioner to higher authority.

Mr. SMITH, of Missouri—It seems to me, Mr. President, that there can only be one way by which the suggestion of the gentleman from Illinois (Mr. Reynolds) can be carried out, and that is by providing for an appeal to all of the commissioners—the cattle being arrested in transit until a decision is had from them.

In case of a provision of that kind, it seems to me that unless the owner of the cattle should consider himself very much aggrieved by the decision of the assistant commissioner, he would not be willing to submit to the delay incident upon an appeal to the full board, but would prefer to abide by the first decision.

I move to amend by adding to that section, "and an appeal shall be allowed to the commissioners in all such cases."

The PRESIDENT—Suppose we weigh this matter a little, gentlemen. Take the case of cattle being detained at Buffalo. I can be readily on hand, but another member of the board, Mr. Patrick,

lives in Syracuse, one hundred and fifty miles from there, while yet another member, Mr. Gould, lives in Hudson, which is two hundred miles further east. There would be a very great inconvenience in getting these gentlemen all together, though two could be quite easily reached, and I suppose that would be the case in other states as well. Suppose, sir, that instead of "commissioners," you say, "to a majority of the commissioners."

Mr. Smith, of Missouri—I accept your amendment, Mr. President.

Dr. Rauch, of Illinois—I will suggest, Mr. President, that instead of saying "a majority of the commissioners," say "one commissioner," for it is absolutely necessary, sometimes, that cattle should be stopped at once, and also, that in case of difference of opinion, a decision on appeal should be had in the shortest possible time.

Dr. Morris, of New York—Mr. President, I heartily second the motion of the gentleman from Illinois (Dr. Rauch); for I fully appreciate the motives which caused him to make it.

Butchers are very anxious to get the cattle into the slaughter houses. They can be bought at reduced prices, on account of defects, extensive bruises or disease; then the butchers will take them and spirit them away, right under the eye of the commissioner, if that can possibly be done. I had that occur in my own experience, and remember one case, particularly, where eighteen head were taken out of the yard without a permit and driven to the slaughter house, where they would have been beef within an hour, if I had not discovered the facts.

The power of assistant commissioner, in these cases, should be absolute and without any appeal, for in no other way can these animals be certainly detained.

Prof. Smith, of Missouri—I see precisely the same difficulty as the gentleman from Illinois (Mr. Reynolds) does. Here is a herd which the inspector wishes to stop. The drover is anxious to get on, and will give $100 to go through and say nothing—that, of course, we cannot prevent. But, suppose the inspector chooses to stop them for his own satisfaction, then, either party may appeal to the commissioner. I do not believe that so much power should be entrusted to a single inspector, from whose decision no appeal can be taken.

Mr. Poole, of Indiana—I merely wish to make one remark, Mr. President. I was a member of that committee whose report is now under discussion, and while I do not like any exercise of arbitrary power in a free government like ours, there are yet times, occasions and circumstances that necessitate it. We acknowledge it and have acknowledged it in our government from time immemorial. For instance, coming to New York from Europe, you are boarded at Sandy Hook, and the vessel is examined by one man. The whole vessel is examined, and if there happens to be any one on board with anything like a contagious disease, that person is forced to remain at quarantine as long as the officer sees fit. We are asking, only, that the one-man power shall be used in a case somewhat parallel, for is it not as positively an actual necessity that cattle should be prevented from shipment, who would breed an infectious disease, not only among their own kind, but among the human family as well. I think that the safety of the people of all communities, throughout the country, requires that this arbitrary power shall be used, at times, as an exigency that cannot be avoided.

Let the resolution pass; then let each legislature protect its own people as the circumstances and localities of the state require—as they certainly will do, no matter what we recommend here.

Dr. McMillan, of Ohio—I think, Mr. President, we had better let this matter remain as it is. I presume that none of our legislatures will appoint commissioners without first requiring them to give heavy bonds for the performance of their duty. If, then, a commissioner damages a dealer by arresting his stock, he is made responsible, and the courts will try the question.

Dr. Kile, of Illinois—As a deliberative body, Mr. President, we should recommend nothing that will not be found beneficial to and be enacted by the different states. Now, while such a proposition as this which is proposed might be adopted, for instance, in other parts of the country, how could it be made to work in a state like Illinois, with her 2000 miles of railroad; with ferries at every crossing for 400 miles along the Mississippi, and for 300 or 400 along the Ohio and the Wabash. In Pennsylvania and New York, there are a few single points to which all cattle tend, and where they can be inspected without any trouble to the shipper or to the purchaser. But suppose, that here, at any point in Illinois, I am obliged to halt a drove of cattle at Tolono, until the com-

missioners—scattered all over the state—for there will have to be a very great many of them—shall have decided my appeal. Why, sir! the whole scheme is perfectly futile. So far as the State of Illinois is concerned, I cannot see that it would be of any practicable benefit.

While I am ready to admit that this proposition will work very well in the eastern states, I do think that it proposes to place too much power in the hands of one man, in view of the manner in which this power must be distributed over this section of the country.

Dr. Miles, of Michigan—Mr. President, it is certainly time that somebody must have the power to stop diseased animals, if we have any sanitary regulations whatever. I do not exactly appreciate the point of the last gentleman, relative to his cattle being stopped at Tolono, for if they are diseased, they certainly should be stopped at the very first start, in order that the eastern states and the rest of our new territory may be protected.

Then, again, if it is understood that diseased animals are not to be allowed to go forward, dealers will be very careful how they start such in the first place.

Mr. McCoy, of Kansas—It does seem to me, Mr. President, that this measure proposes to vest too much power in one man, and besides that, in view of the laws of some of the states, it would be practically impossible to carry it out. In Missouri, for instance, it is provided that each county shall appoint three commissioners, who shall constitute a board of cattle inspectors, whose duty it shall be to inspect cattle when presented, and, if found healthy, to admit them.

The appealing from the decision of one of these commissioners would, if such a proposition as the one proposed were enacted into a law, be almost ruinous to the drover. The consequence would be that very many of these officials, knowing the unwillingness with which an appeal would be taken, would levy black-mail on the cattle passing through their district, whether they were healthy or not.

Or, if the one-man power principle should prevail, no means of appeal being provided, every one who knows anything about our western country can but see how great a detriment it would work to the bringing forward of our cattle. That man would have the power, as we express it west, to make every drover bringing in

cattle for inspection, "come down" a little, or very politely inform him that his cattle are diseased. Time and again, I have heard drovers coming through the southwest say, in being asked how they succeeded with these commissioners—"Well, I presented a few *green* arguments to them, and it was the easiest thing in the world for them to see that my cattle were healthy."

I tell you, gentlemen, this measure proposes to put too much absolute authority and power in the hands of one man, especially when no means of appealing from his decision are provided.

Mr. Barrett, of Missouri—There certainly, Mr. President, ought to be some provision by which the cattle-drover may be protected. If you provide for an appeal from the decision of an assistant commissioner to a commissioner or to several commissioners, that functionary is going to be very careful how he stops cattle, and if he does stop them when they are not diseased, in order that he may gain a certain sum of money thereby, he will most certainly lose his position, when the case in which he has so conducted himself comes to be investigated.

I do not wish to detain the convention, Mr. President, and am not anxious to make any speech.

Mr. Hamilton, of Pennsylvania—I am in favor, Mr. President, of letting each legislature decide this matter for its respective state. For instance, you here in Illinois can appoint an inspector to inspect an inspector and another inspector to inspect the two inspectors. [Laughter.] Some gentlemen seem to think that inspectors are to be bribed, all over the country; if that does turn out to be the case, then they will all be a set of infernal rascals—and that is something that I do not believe will be the case.

Mr. Piper, of Illinois—There is one point, Mr. President, that strikes me, which is just this. I do not think that any Illinois man is going to bring in diseased cattle—even try to get them passed—when he knows that even if he succeeds in doing both of those things, he has still got the eastern inspections to face.

Mr. Reynolds, of Illinois—I offer the following, Mr. President, as an amendment to the amendment of the gentleman from Missouri (Mr. Smith):

"In case the decision shall be against the inspector, the state shall indemnify the owner for reasonable damages and expenses."

MR. SMITH, of Missouri—I accept that amendment, Mr. President.

MR. GOULD, of New York—Mr. President, I call for a division of the question on the amendment.

The motion prevailed.

THE PRESIDENT—Gentlemen, you will now vote on the first branch of the amendment, which is, "appeals shall be allowed to a majority of the commissioners in all such cases."

The amendment was adopted.

Ayes 19; nays, 12.

THE PRESIDENT—You are now about to vote upon the second division of the amendment, which is as follows:

"In case the decision shall be against the inspector, the state shall reasonably indemnify the owner for reasonable damages and expenses."

The amendment was lost upon *viva voce* vote.

The proposition was then adopted as amended.

The secretary read the third section of the second subdivision, as follows:

3. No train shall be allowed to proceed unless the animals contained therein have been supplied with food, water and rest within twenty-four hours next preceding the time of such inspection.

MR. POOLE, of Indiana—I move that it be adopted.

The motion prevailed.

The secretary read the fourth section of the second subdivision, as follows:

4. All animals shall rest and have access to food and water for twenty-four hours, after having traveled for a similar period.

MR. POOLE, of Indiana—I move that it be adopted.

The motion prevailed.

The secretary read the fifth section of the second subdivision, as follows:

5. The railroad companies shall provide suitable yards for feeding, watering and resting the animals traveling on their trains, and for quarantine purposes, which shall be kept in as cleanly and wholesome condition, to the satisfaction of the commissioners.

MR. POOLE, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the sixth section of the second subdivision, as follows:

6. Each train, on leaving its point of departure, shall have certificates signed by an assistant commissioner, which shall certify that all the animals therein were in a healthy condition at the time of its departure, and also the exact time of its leaving; and such certificates and indorsements thereon of the time of resting and the time of departure of the train at subsequent resting and feeding places shall be exhibited to the proper authority whenever required.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the seventh section of the second subdivision, as follows:

7. Proper penalties should be inserted to prevent the bribery of officers charged with the execution of these provisions.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the eighth section of the second subdivision, as follows:

8. Proper penalties should also be provided for those who interfere with or resist the officer, charged with the execution of these provisions.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the third general division, as follows:

8. Whereas, A malignant disease among cattle, known as Spanish fever, has been widely disseminated by the transit of Texas and other southwestern cattle through the western and northwestern states, during the warm season of the year, occasioning great loss to our farmers, and possibly endangering the health of our citizens therein,

Resolved, That this convention earnestly recommend the enactment of stringent laws to prevent the transit through these states of Texan or Cherokee cattle from the first day of April to the last day of October, inclusive.

Mr. Earle, of Indiana—I move to amend, Mr. President, by inserting "first" instead of "last" day of October.

Mr. McMillan, of Ohio—And I move to amend, Mr. President, by striking out the "first day of April" and inserting the "first day of March."

Gen. Patrick, of New York—I would like to say a word, Mr. President, regarding this question of time. As to how early in the season it might be wise to admit cattle, I am not able to say,

but I do know that on the twenty-fourth day of November, we found in the city of Buffalo, while *en route* for this place, two of the sickest and most thoroughly diseased Texas steers I have ever seen—one of which died within an hour or two, and the other of which would have died within twelve hours, had it not been killed for the purpose of examination. This happened after we had had heavy frost and some snow. I think, as we know from Mr. Hill's statements, the disease still exists in this state.

Mr. Christie, of Canada—If I mistake not, Mr. President, it has also been stated that this disease is still prevailing in St. Louis.

Mr. Poole, of Indiana—I am told, Mr. President, by gentlemen who had much more experience in this matter than I have had, that they are perfectly satisfied there is no danger at all after the first of October, by which time, as a general thing, we, here in the west, have heavy frost. It is not expected that cattle brought here at that time would be shipped—they could not be, on account of their poor condition; but the idea is to keep them here all winter, feed and graze them the next season, and the next fall send them to a market. There may be isolated cases of the disease, and some cattle may die after the first of October. And, as regards the statement of Mr. Hill, I understand him to say that the animals referred to died from the effect of disease imported by cattle in the hot season, and not from cattle brought this fall—and he distinctly states that to be the fact. His remarks, therefore, furnish no data for supposing that cattle bring any disease among us as late as October.

Gen. Patrick, of New York—My impression is, Mr. President, and I will state that it is so with another of our commissioners (Mr. Gould), that the cattle we saw in Buffalo were from a herd just purchased and brought forward from Kansas.

We, of course, understand the propriety of bringing cattle into this state at as early a day as possible, for the reasons already stated, but some safeguards certainly should be thrown around the trade, by which the shipment of such cattle may be prevented.

Mr. Christie, of Canada—Mr. President, Mr. Hill's statement, as I understand it, was this—that those steers died within eight days. What does that statement prove? It proves just this, that if they had not been in contact with Texas cattle since the cattle belonging to the same herd died (and I understand that to be Mr. Hill's statement), that those cattle were contaminated by the na-

tive cattle of the same herd, and after the period necessary for the second incubation of the disease had elapsed, took that disease and died. This one instance sufficiently proves the impropriety of allowing cattle to come in at an earlier date than is specified, because what has happened in Illinois may happen in Kansas. It also establishes the fact that the disease may exist up to the twenty-fourth day of November—the meeting with it at Buffalo at that time, has already been spoken of—and for all we know, it may exist later still.

Dr. Johns, of Illinois—So far as I am advised, Mr. President, cattle in the condition of those met with at Buffalo, have never imparted the disease under any circumstances, for as we learned the history of this disease, it has never been communicated except by cattle in apparent health. We have no testimony that those cattle had imparted the disease (in fact, the universal testimony is, that it is not communicated after frost), though they may have had and probably did have it.

Mr. Hill has not stated what the cattle spoken of by him died from, and those gentlemen who jump at the conclusion that they died from Spanish fever, have very slight grounds for their belief. In the west, nothing but a post-mortem examination can determine as to whether a certain animal has died of this Spanish fever—and it is not stated that these steers were so examined.

Mr. Earle, of Indiana—I hope, Mr. President, that gentlemen will consider well, before casting their vote, for it is of the utmost importance that these cattle should be brought in here at as early a day as possible, in order that they may rest before cold weather, get well over their bruises and take their winter feed properly. If they cannot be brought in until November or December, they become so sore and are in such bad condition that they will not take their feed and go through the winter as they ought.

Mr. Gould, of New York—Mr. President, our experience in New York shows, that it will not be safe to admit cattle into that state at as early a period as is proposed by the amendment. As was stated by my friend (General Patrick), this disease has manifested itself as late as the twenty-fourth of November, and I may state in addition to that, that in the county of Orange, on the twenty-sixth day of October, a native cow died, which had taken the disease from another native animal. There are cows in the state of New York which could not be purchased for fifteen thou-

sand dollars; there are also cows and bulls in Canada that could not be purchased for a very large sum, and in both sections there is a large amount of very fine stock. It behooves us, therefore, to be exceedingly careful how we expose our herds to the ravages of this fearful disease.

But why cannot we change this proposition, so as to admit these cattle into Illinois and the grazing states (as they seem to desire), on the first day of October, while we substitute the first day of November for the province of Canada, the state of New York, and the states lying east of New York. It seems to me that by agreeing upon that, we can act harmoniously.

Mr. Moore, of Missouri—If that proposition suits New York, Mr. President, it suits Missouri. Illinois knows what she wants, but we in Missouri don't wish to have these animals brought through that state at so early a day as some gentlemen propose.

Dr. Miles, of Michigan—While I am anxious, Mr. President, to facilitate the transmission of cattle to eastern markets, it is of the utmost consequence that we protect ourselves; but as Missouri, Kansas and other states lying farther west, are as much interested in this matter as we are and understand it better, I would like to hear from gentlemen, representing these states, in regard to the matter.

Mr. McCoy, of Kansas—Mr. President, through this portion of Illinois, a large portion of Missouri and Iowa, and also a portion of Kansas, the farmers rely upon disposing of their products by preparing fattening stock for the eastern markets.

Again, sir, there is no proposition embodied in this report whereby cattle from the southwest, even after being wintered, may be moved to market, notwithstanding there are to-day, coming into Illinois, by the Union Pacific Railroad, ten thousand head of southwestern cattle, which are to be fattened this winter upon the pastures of Illinois particularly, and of Indiana, in part—a large per cent. of which will be ready to go to market in July. But as I have said, there is in the proposition no provision whereby those cattle, when fattened, may be permitted to go to market.

Again, do you propose, gentlemen, to prohibit the people of the southwest from coming to market at all—do you propose to make recommendations here to-night, the practical effect of which would be to exclude us utterly and completely? I believe every gentleman, in his own heart, would answer "no." But, I declare to you

that such will be the practical effect of these propositions if embodied and enforced as laws.

That is all that I have to say, gentlemen; you can do as you like, but you must take the responsibility.

Mr. Poole, of Indiana—This resolution, Mr. President, is not such a one as will suit the states of New York, Illinois or Indiana, for this reason. That resolution says: "Texas cattle shall not be admitted from the first day of April to the last day of October." Its terms are broad enough to prevent from being shipped to market, cattle which have been wintered and fattened here. Some discrimination must be made, specifying more particularly what animals are meant.

The President—The understanding of the resolution by the chair is, that cattle shall not be introduced from the south-western country into these states.

Mr. Poole—But it does not say so, sir, and any such construction must be an inference only.

By the way, in regard to those cattle at Tolono, I do not think that case goes, by any means, to show that those animals took the disease from the native cattle.

Mr. Christie, of Canada—How do you account for it, sir?

Mr. Poole—In the same way as you, sir, as a common-sense man, would account for a great many contagious diseases through the United States, both among the human family and animals—that is, that some persons will be affected by a disease very quickly, while in others, it will linger and linger for months, before breaking out. I leave it to any medical or scientific man, if that may not be the case here, for these cattle ran in the same places and over the same trails as did those who took it so early and died. They may have become gradually infected with the disease, and the poison have worked very slowly in the system, but in the course of time, have sickened and died from it.

Mr. Christie, of Canada—The simple answer to all that, as it seems to me, Mr. President, is, that, as yet, we have no evidence showing that the time necessary for the incubation of the disease is longer than ten weeks.

Mr. Earle, of Indiana—When did the Texas cattle that died in Buffalo, take this disease?

Mr. Christie—I cannot say, sir. They may have come directly from Texas, but that is an answer, so far as the picking-up of their

pasturage in the same field where the Texas cattle had pastured, is concerned.

And then, again, according to the gentleman's own statement, a severe frost will kill this disease.

Mr. Poole, of Indiana—We all know, Mr. President, that both animals and people freely take contagious and infectious diseases at different periods, as for instance, I have known some animals to take this Texas cattle disease in three weeks, others to have been seven weeks in contracting it, and others probably ten, and this being so, might not the periods be still farther extended?

Dr. Miles, of Michigan—The gentleman speaks, Mr. President, of the time required for taking this disease. I should like to know if he means after the exposure of the animal, the period of incubation, or the time that the native cattle may run with the Texas cattle without taking it.

Mr. Poole—I meant, Mr. President, from the time the animal was exposed, until it exhibited any sign of the disease.

Dr. Miles—It is said, Mr. President, that native cattle may run with Texas cattle a long time without contracting the disease—that when separated, some have not taken it at all, while others which remain will have it.

Mr. Poole—They may, or may not. Mr. Eaton will tell the gentleman that some never take it.

I have certain knowledge, sir, of some native cattle that have run with Texas cattle the whole summer, without contracting any disease at all. So also, I know, that some men have passed into a small-pox room and staid there a week without contracting that disease; while I know others who have taken it a long time afterwards.

And so, in regard to these steers that have been spoken of. My idea is that they actually imbibed a small amount of this disease at the same time that these other cattle did, but that it remained in their systems in a very small speck, so to speak, until gradually extending, they became, after quite a long time, infected with it, and so died.

Mr. Christie—Four months.

Mr. Poole—Yes, sir; that seems to me not at all improbable, Mr. President, in view of the statements we have already had, to the effect that cattle placed in pasture where Texas cattle had run and

pastured the winter before, had, the next season, taken this disease and died.

I will say, however, that after careful inquiry and diligent search of reports, I have never yet heard of or seen recorded a single case of Texas cattle fever occurring in Texas or along the gulf coast. That being so, it seems to me that the whole history of this disease may be summed up in this—that the abuse of these cattle, and the over-driving of them while on their way, by being crowded in the cars and steamboats, and forced along in that brutal manner that is too well known, breeds an infection in the system. That is my idea of this matter.

We are willing, as western men, to divide the time, and make it, say the fifteenth of October.

The amendment was accepted.

Mr. Reynolds, of Illinois—It seems to me, Mr. President, that this matter can all be arranged if a blank is left for the time. Each state can settle this matter for itself. By adopting this course (especially in view of the fact that you have appointed a commission which certainly ought to be able to fix upon a proper time) no harm can be done, and this convention need not be troubled farther.

Mr. Christie, of Canada—The adoption of that suggestion, Mr. President, would cause all the proceedings of this convention to be a perfect nullity.

I wish to call the attention of the convention to the laws of the states west of this. Missouri says: "Nothing contained in this act shall be so construed as to prevent the transportation of such cattle through this state, on railroads or steamboats, or to prohibit the driving through any part of this state of such Texas or southern cattle as have been wintered at least one winter north of the southern boundary of the state of Missouri."

Kansas enacts: "No person or persons shall be allowed to drive or cause to be driven into the state of Kansas, or through any part thereof, any cattle from the Indian territory south of Kansas, or from the state of Texas, that may have come into the state between the first days of March and December of each year."

The law of the state of Illinois is entirely prohibitory. The law of Kentucky was: "It shall be unlawful for any person, after this act takes effect, during the time between the first day of March and the first day of November, in any year," etc. That

law was amended this year, to read as follows: "That an act approved February 28, 1867, entitled 'an act to prohibit the importation and sale in this commonwealth,' be, and the same is so amended that it shall be lawful to import such cattle into the state at any time between the twentieth day of November and the first day of April in each year."

Those are the laws fixed by the legislatures of several of the states that have suffered very much from this disease, and it does seem to me that they furnish some reliable data by which this convention may be guided.

I cannot believe that we have come together from such long distances, and at, in many cases, so much inconvenience, to pretend to thoroughly discuss the series of propositions for the purpose of controlling this disease, and then to, after all, acknowledge to the world that we knew nothing at all about it, and that cattle may be admitted at any time during the year.

Mr McMillan, of Ohio—It seems to me, Mr. President, that we should act on the safe side, regarding this matter. It does not appear that there really is not danger, more or less, at any time of the year, and if three or four months are set apart during which these cattle may be brought in, I do think that all is conceded that should be asked for, and that we are entitled to demand for the rest of the year such protection as our home interests require.

I therefore move to amend so that the dates shall read from "the first of March to the first of November," and on this I move the previous question.

The President—Gentlemen, you have heard the motion, will you sustain the call for the previous question?

["Call the roll—call the roll."]

The President—The secretary will call the roll.

Accordingly the roll was called.

The motion prevailed.

Yeas 24—nays 7.

The President—Gentlemen, you will now vote on the motion of the gentlemen from Ohio (Mr. McMillan), that Texas cattle shall be excluded between the first day of March and the first day of November.

The motion prevailed.

Mr. McMillan, of Ohio—I move, Mr. President, that the original proposition, as amended, be now adopted.

THE PRESIDENT—Mr. Secretary, you will please read the last paragraph of the report submitted by your committee.

The secretary read as follows:

Resolved, That the interest of the community require the enactment of laws making any person responsible for all damages that may result from the diffusion of any dangerous disease from animals in his ownership or possession.

MR. POOLE, of Indiana—I move, sir, that it be adopted.

The motion prevailed.

MR. CHRISTIE, of Canada—I move, Mr. President, the adoption of the report as a whole.

The motion prevailed.

MR. HAMILTON, of Pennsylvania—Mr. President, I offer the following resolution:

Resolved, That the governor of Illinois be requested to have printed and forwarded to the governors of the several states here represented, and to each delegate, a copy of the propositions just adopted.

I offer this resolution, Mr. President, in order that these drafts of proposed laws may be transmitted to the governors of the respective states who have sent us here, and be by them embodied in their "messages," as I know some, at least, desire to do.

MR. GOULD, of New York—I must confess, Mr. President, that it does not seem to me the most delicate thing in the world for representatives of the different states to request the governor of Illinois to take upon himself all the trouble and expense that will be incurred if the resolution is adopted.

DR. CLENDENNIN, of Ohio—That is exactly my view of the case, Mr. President; and besides, I presume that the chairman of each delegation will report to the governor of his own state such of our proceedings as may be by him deemed necessary.

MR. CHRISTIE, of Canada—I have not the slightest idea, Mr. President, that the governor of Illinois will regard such a request from this convention at all out of place. I renew the motion for the adoption of the resolution.

The motion prevailed.

MR. REYNOLDS, of Illinois—I move, Mr. President, that we do now adjourn to nine o'clock to-morrow morning.

The motion prevailed.

So the convention adjourned.

THIRD DAY.

THURSDAY, *December* 3, 1868.

The convention met, pursuant to adjournment.

DR. SNOW, of Rhode Island—Mr. President, the committee appointed on the subject of a name whereby the disease under consideration may be designated, have instructed me to report the term "Texas cattle fever," as being, upon the whole, a designation which will be best understood, and the most acceptable to the people.

MR. EARLE, of Indiana—I move, Mr. President, that the report be received and concurred in.

The motion prevailed.

MR. POOLE, of Indiana—Mr. President, as the propositions adopted by us yesterday, for the purpose of being enacted into laws by the legislatures of the respective states, make no discrimination between cattle directly from Texas and those which have been wintered and prepared here for market, I offer the following resolution, as explanatory of the interpretation which this convention gives them. It is as follows:

Resolved, That in the resolution passed by this convention in regard to Texas and south-western cattle, and the time of their being admitted into the different states, it was not intended to mean or be construed to include Texas or south western cattle that had been wintered in any of the states, except in Texas, the previous winter.

I move the adoption of that resolution, sir.

The motion was seconded.

DR. MORSE, of Missouri—I do not think, Mr. President, that there is anything particularly wrong about this resolution, but there may be; and as at least one-third of the convention which adopted the propositions of yesterday (of one of which this resolution is said to be explanatory) have already left the city, it would be manifestly unfair for us to adopt this.

DR. TOWNSEND, of Iowa—I quite agree, Mr. President, with the gentleman from Missouri (Dr. Morse) that it would hardly be fair, now, to add any new matter to what has already been passed upon by this convention. I hope the gentleman will not press the resolution.

Mr. Poole, of Indiana—It was distinctly stated last night, Mr. President, if I am not very much mistaken, that the proposition of which this resolution is intended to be explanatory, was not intended to include cattle wintered in the western or north-western states previous to their being sent to market.

The President—That would be the understanding of the chair.

Mr. Poole—Exactly, Mr. President; and I am satisfied that there was not a member of the convention but who understood it in the same way.

Mr. Earle, of Indiana—Allow me to state, Mr. President, that I personally spoke to the chairman of the Canadian commissioners (Mr. Christie) in regard to this matter. I was informed by him that they interpreted the proposition of which this resolution is intended to be explanatory, exactly as the chair does; and I know that to be the sentiment of the convention at large.

I hope gentlemen will not embarrass what we have already done by voting down this resolution, for its adoption is really necessary to a proper understanding of our proceedings by those into whose hands they may hereafter come.

Dr. Miles, of Michigan—This same matter was broached at our last session, Mr. President, and it was admitted on all hands that there was no necessity of adopting anything of an explanatory nature. I think, myself, that there can be no misunderstanding in regard to it, as it now stands; and I do hope that this fragment of the convention will not attempt to explain what the whole convention considered sufficiently clear.

Mr. Chadbourne, of Wisconsin—I think, Mr. President, that it is unfair for so small a number of us to change what was last night adopted by the whole convention. I voted on the question of time during which Texas cattle should be admitted, in accordance with what seemed to be the desire of the states mostly interested; though my own judgment was, that, in some of the states at least, cattle might be introduced by the 1st of October.

But at any rate, the whole convention having recommended a certain measure for adoption by the state legislatures, I do not think that so small a number as are now present should meddle with the subject further.

Dr. Rauch, of Illinois—Regarding the time at which Texas cattle should be admitted, Mr. President, I quite agree with the

gentleman from Wisconsin (Mr. Chadbourne), for I am satisfied from the experience of the past season that they can be brought to Chicago by the first of October, without any danger. But I scarcely think it is necessary, or that it was expected, that the proposition under discussion should apply to Texas cattle wintered here, and fattened during the next summer for the eastern markets.

The President—I would simply remark, gentlemen, that at Buffalo, of which point I have supervision, and where there are, say, two or three car loads of cattle arriving daily, it is one of the most difficult things in the world for the commissioners to ascertain whether those cattle have been in this western country a year or a month.

Mr. Poole, of Indiana—I merely offer this resolution, Mr. President, for the purpose of explaining a proposition which, as it now stands, might be considered by one person reading the reports of our proceedings to mean one thing, while another would construe the language to mean exactly the opposite thing. It seems to me exceedingly important that when the legislatures of the respective states consider our propositions for the purpose of enacting them into laws, there should be no possibility of misunderstanding on this point—that it should be distinctly understood that, between the dates specified, we did not mean to exclude cattle that had been here a year or two, undergoing preparation for market.

I believe it is conceded that that was the understanding of the whole convention upon adopting this proposition at the last session. That being so, there can be no unfairness in the adoption of this explanatory resolution by those of us now present.

Mr. Gould, of New York—I hardly think, Mr. President, that the terms of this resolution are sufficiently guarded, but the general idea of it is eminently fair and proper, for we certainly do not wish to retain for a long time, in this western country, cattle that have been thoroughly disinfected.

When Texas cattle are brought to the frontier of any state, the commissioners and assistant commissioners thereof must be relied upon to determine any question of fraud with regard to the place of their importation and the time which they have spent there, and our people should not be deprived of a large amount of en-

tirely unexceptionable beef through any ambiguity in our proceedings.

I cannot believe, Mr. President, that the important stock-growers and forwarders of the state of Illinois, or of any others of the western or northwestern states, would deliberately swear to a lie regarding the length of time their cattle may have spent in their section subsequent to their leaving Texas, and prior to their being forwarded to a market. I cannot believe it, sir, in face of the fact that as soon as Mr. Alexander was apprised of the diseased condition of his cattle he went around to gentlemen who had bought a portion of them (and that, too, without waiting for them to come to him), paid back to them the purchase money, and submitted, in the first instance, to a loss of twenty-seven thousand dollars. I do think that as long as there are men in the western country who pursue such a course as that, we may venture to take their affidavits with regard to anything concerning their cattle.

I should feel perfectly satisfied, as far as New York is concerned (and I believe other states will feel perfectly satisfied), with a proper affidavit, from an honest man, that his cattle have been for a certain time, say ten months, in the state of Illinois, for instance, being fed and fattened for a market. I should therefore be in favor of the resolution, with some little addition, like this, for instance, "provided that proper proof should be afforded," etc.

Mr. Poole, of Indiana—I accept that amendment, Mr. President.

Mr. Emery, of Illinois—It seems to me, Mr. President, that we shall find the result of this to be that all the stock of the state will be old stock.

Mr. Gould, of New York—I do not quite agree with the gentleman, Mr. President, because, as the proposition now stands, not a single Texas animal can be received after the first of March. The point is this, that there are now in this state, for instance, a vast number of cattle which will be in proper condition to send to market in May or July, but which are excluded by the terms of the resolution, as it now stands, and I do think that some provision should be made by which that difficulty can be avoided. It seems to me that it is nothing more than fair dealing with our western friends—who have so generously endeavored to meet with our wants, that I, for one, wish to show a similar spirit of amity in protecting their interests.

Dr. Townsend, of Iowa—I wish to say just a word or two more upon this subject, Mr. President. Last night, when this matter was up for consideration, several of us desired an adjournment, in order that this and other points might be deliberately acted upon. The convention did not adjourn, but its work was then supposed to be finished. And now that we have committed the very common folly of putting our work through in a hurried manner, we ought to take the consequences, and not, in this way, endeavor to perfect measures which ought to have been more carefully considered.

Again, the fact that we have this large amount of cattle in Illinois, is not going to embarrass the owners of them at all, for our resolutions and propositions are not the law of the state yet, by any means, and when they are enacted into laws the legislature will doubtless provide the necessary safeguards and explanations. I therefore do not think that this resolution is at all necessary.

Mr. Hamilton, of Pennsylvania—I was at first inclined to favor this resolution, Mr. President, but now I shall vote against every proposition to amend what was done last night. First, because I do not think that so small a number of the convention as are now present, should meddle with what was passed upon by the whole convention. nd secondly, because the legislatures of the several states will undoubtedly remodel our propositions and resolutions in such a manner as will best meet the wants of their constituents.

Gen. Patrick, of New York—It strikes me, Mr. President, that practically, this thing takes care of itself; for nearly, if not quite all of these cattle spoken of will have gone to market before the several legislatures will have taken action on our recommendations.

Besides that, the expression of opinion regarding the interpretation of this particular resolution, and the views in reference to it are so harmonious, that I do not think our intention can be misconstrued.

It does seem to me, too, that it will be acting unfairly towards the large majority of this convention—who have gone away supposing that the work of this convention was practically completed—to attempt to re-open this matter.

Mr. Gould, of New York—I offer, Mr. President, the follow-

ing, and move that it be inserted after the excluding paragraph in the original resolution as reported by the committee: "*Provided*, that it may be lawful to receive at any time cattle which have been ascertained, by proper proofs, to have been fed in any state north of Arkansas for a period of ten months next preceding the time of passing the frontier of any state."

MR. POOLE, of Indiana—I do not accept, Mr. President, the proposition of the gentleman from New York (Dr. Gould) for this reason: If the amendment should be adopted by the convention, and be promulgated as law by our next legislature, it would preclude our cattle from going to market during the summer, as scarcely any that are now being and that will, during this winter, be prepared for market, will then have been within the state so long a time as ten months.

MR. GOULD—Say eight months, then.

MR. POOLE—As this resolution has occasioned a great deal of discussion, Mr. President, and has excited some considerable opposition upon one ground and another, I now withdraw the resolution and move that we adjourn *sine die*.

MR. EARLE, of Indiana—Then, Mr. President, I offer the following:

Resolved, That all Texas or southwestern cattle that have been wintered in the state, shall be considered as native cattle.

MR. GOULD, of New York—I offer this as an amendment, Mr. President: "And that have been ascertained by proper proofs to have been wintered."

MR. EARLE—I accept that amendment, Mr. President. I move that the resolution be adopted as amended.

MR. CARTER, of Maryland—I offer the following resolution, Mr. President, and move its adoption:

Resolved, That the thanks of this convention are eminently due, and are hereby tendered to the Hon. Lewis F. Allen, for the able, courteous and impartial manner in which he has discharged the arduous duties of president of this convention.

Gentlemen, you have heard the resolution. As many as are in favor of its adoption, will please so signify it by saying aye.

The resolution was unanimously adopted.

MR. CARTER, of Maryland—Mr. President, I offer the following resolution and move its adoption:

Resolved, That the thanks of this convention are hereby tendered to the Governor and cattle commissioners of the state of Illinois, and the citizens of Springfield, for the kind and liberal hospitality extended the members of the convention during our sojourn in their midst.

The resolution was unanimously adopted.

Mr. Carter, of Maryland—I offer the following, Mr. President:

Resolved, That the thanks of the convention are hereby tendered to Hon. Joseph Poole, of Indiana, temporary chairman, and the officers of the convention, for their efficient discharge of the duties of their respective positions. Also, to Dr. Morean Morris, of New York city, and Dr. John H. Rauch, of Chicago, Illinois, for their valuable contributions to the scientific information of the convention.

The resolution was unanimously adopted.

Dr. Clendennin, of Ohio—Mr. President, I offer the following resolution:

Resolved, That the secretaries of this convention, together with the members from this state—who shall be appointed by the chair—be constituted a committee to superintend the printing and publication of the proceedings of this convention.

The resolution was unanimously adopted.

The President—I appoint Messrs. Rauch and Emery, of Chicago, and Mr. Reynolds, secretary of the state agricultural society, to act in connection with the secretaries, in preparing for publication a report of our proceedings.

Dr. Miles, of Michigan—Mr. President, I move we take from the table the resolution in regard to the appointment of a commissioner for the purpose of investigating the Texas cattle disease.

The motion prevailed.

Dr. Miles—That resolution, as originally offered, Mr. President, was to memorialize "congress." That was stricken out and "war department" inserted. Then, a substitute was offered, authorizing this convention to appoint a commissioner. The whole matter was laid upon the table. The first question, therefore, would be upon the substitute, which I hope will be voted down, as it is ascertained that we cannot command the services of those scientific gentlemen, who were then supposed to be available. We need information at once, and I am satisfied that we can get it in the best manner, from the war department, through its detailing scientific gentlemen to proceed to Texas, and there collect everything necessary to supplement the investigations

already made in New York. I hope, therefore, that the substitute will not prevail; but that the original resolution, as amended, will be adopted.

Dr. Clendennin, of Ohio—Inasmuch, Mr. President, as it would be of no use to memorialize the war department, I move that we reconsider the amendment, whereby, in the original resolution "congress" was stricken out and "war department" inserted.

The motion prevailed.

Dr. Clendennin—I now move that the amendment be laid upon the table.

The motion prevailed.

General Patrick, of New York—Mr. President, I suggest this, "that congress be requested to make an appropriation, to be expended under the direction of the war department," etc. I do not offer that as an amendment, though I think the adoption of it, as such, would secure all that we desire.

Dr. Clendennin—I will accept that, Mr. President, as an amendment. I move the adoption of the resolution as amended.

The motion prevailed.

The President—I appoint, to serve on that committee, Messrs. Clendennin of Ohio, Rauch of Illinois, Gould of New York, Miles of Michigan, and Townsend of Iowa.

Dr. Clendennin, of Ohio—Mr. President, as we all appreciate the importance of obtaining more general and accurate knowledge of the diseases incident to our native stock, I offer the following:

Resolved, That the delegates of the several states here represented shall feel themselves called upon to represent to the legislatures of their respective states the necessity of adopting some measures for the collection and diffusion of more accurate knowledge relative to the habits and diseases of our domestic animals.

In the west, Mr. President, we have no institution specially set apart for these purposes, though I am aware that in New York you have. I believe that such a resolution as I have offered, emanating from this convention, will receive intelligent and favorable consideration, I move its adoption.

The motion prevailed.

Mr. Reynolds, of Illinois—I offer this resolution, Mr. President:

Resolved, That when the committee on publication shall have prepared the report of the proceedings of this convention, they be and hereby are requested to forward the copy thereof to the Governor of Illinois for publication.

MR. GOULD, of New York—Though this resolution is offered, Mr. President, by a member from Illinois, I feel very delicate about asking the governor of this state to incur this expense on behalf of the convention, and I must confess that it does not seem to me just right to throw the whole burden, at least, upon Illinois.

MR. REYNOLDS, of Illinois—I am authorized to say, Mr. President, that Governor Oglesby is willing to receive the report as indicated in the resolution, and further, that he will see the proceedings published and distributed to the members of the convention, the heads of states and wherever else may seem most desirable.

I move the adoption of the resolution.

The motion prevailed.

MR. HAMILTON, of Pennsylvania—Mr. President, I move that we do now adjourn, *sine die*.

THE PRESIDENT—Gentlemen, before putting that motion you will permit me to offer you my congratulations upon the successful prosecution and termination of your labors. You have met under circumstances of great responsibility, and I must say, of somewhat great public excitement; you have discharged your duties, I think, faithfully and well.

To the Governor of the State of Illinois, we are under great obligations for the hearty zeal with which he co-operated with the first inception of this movement, which he has carried out with so much earnestness and good will, and we cannot also but feel greatly obliged to him that he has by his presence added so much to the dignity of this convention through being daily with us and giving to us his countenance and approbation.

For myself, gentlemen, I feel very highly honored at being elected to preside over a body representing so much wealth and integrity of character as is combined in this convention, wherein so much wisdom and so much executive ability are required at the hands of its presiding officer.

But, so far as regards myself, personally, the best thing that I can do is to tell a story, as was occasionally the habit of the lamented Lincoln.

Some four years ago, before that best of men was foully murdered, I, as an old acquaintance and a great admirer, called to see him. *I did not*, gentlemen, wish to ask him for any office, but merely looked in on him, socially. I congratulated him on the success with which he had managed the affairs of the government, when he, with all the simplicity and artlessness of a child, replied, "Mr. Allen, I have done just as well as I knew how."

Gentlemen, I have done just as well as I know how, while presiding. I feel truly gratified at the confidence you have placed in me and at the hearty vote of thanks you have accorded me. Wishing each and all the utmost measure of prosperity (great applause), I bid you farewell.

The convention now stands adjourned, *sine die*.

APPENDIX.

DR. RAUCH—I find, since my return from the meeting of the Cattle Convention, that I did not place enough importance upon the results of my treatment of cases of Texas fever. The first animal that showed marked signs of the disease, that recovered, was the one I treated, also that the only ones in a certain section of the Vth ward that are now living, and were exposed, are those that I had treated. I find also that a number of the cases that I supposed under treatment, were really not, as my directions had not been carried out. For the purpose of throwing more light on this question, I append the weights of livers and spleens of Texas cattle that had been fed at Broadlands since June, and also of cattle that were brought direct from Texas *via* Galveston and New Orleans, that were slaughtered here a few days ago. Both lots were fat. I procured the blood, bile, and urine of one of those that had been fed at Broadlands—also, from a steer that came direct from Texas—and submitted them to S. A. Briggs, Esq., an accomplished microscopist, who reports that no trace of the spore or plant can be found.

4½	10	3½	9	3½	9	3½	8½	3	9	4	11	4	11	4	8½	3½	9	3½	8	4½	8½
3½	10	4½	8	2	9	2	10	3½	8½	3½	9	3½	10	4	9½	4	11	3	12	4	9
3	14	4½	9½	3½	10	3	11	4½	10	3½	9	3½	11	4	9	4	8	3½	8	3	8
4	12	3	10	3½	8	3	8½	3	10	3	8½	3	9	3½	8½	3	8	2½	8½	3½	8½
4	9	3½	11	4	9½	3½	8	3½	10	2½	8	3	8	3½	9	2½	11	4	8½	2½	11
3¾	10	4	8	5	12	3	10	3	9	4	8½	2½	12	3½	8	3¾	8	4	9½	3	8
3	8	4½	12	4	12½	4	9	4	8	4	9½	2	11½	4	11	2	12	4½	8½	4	11
3½	8½	4	8	3	9	4	12	4½	8½	4	9	2½	9	3	8	2	10	3½	10½	3½	9
2	11	3	10	3½	8½	3	11	4	12	3	11	3	11	2½	11	3½	11	4	9	4	9½
3	10	3½	10	4	8½	3½	10	4½	10	4	9	4	9½	3¾	8	3½	9	4½	8½	2	8
3	8½	3	9	4	10	4½	10	3¾	9	4	9½	3½	9	2½	12	3¾	12	4	10	2½	12
3½	9	2½	12	3¾	10	3½	10	2½	11	4	8½	3½	9	2½	8	3	10	4½	10½	2¾	9
3½	10½	2	8	3	9	3½	9	2	8	2½	8	3	8½	4	8½	4	11	3½	12	3½	14
3½	11	2½	9	3	8½	3	8½	3	9½	2	12	3	8	4	9½	4½	9	3½	11	3	9
4	8	4½	10	3½	8	3	10	3	8½	3½	8	4	8½	4	9	5	8½	3	9	3½	9½
3½	8	3½	11	2½	8½	3	11	4	8	2½	11	4	9½	4	11	3½	8	4	10	....	.....
3½	10	3	8	2	7¾	3½	8	4½	9½	3	8	2	12	3¾	10½	3½	9	2½	12	....	.....
2	9	4	8½	2½	8½	3	8	4	11	4	11	3¾	8	3¾	12	3	9	3¾	8	....	.....
3½	10	4	9	2	9	4	12	3½	10½	3½	9	2½	10	2½	11	3½	14	2½	11	....	.....
3½	9	4½	12	2½	11	3½	10	3¾	12	3½	9	2¾	9	3	9	2¾	9	3	8	..	.....
3¾	9	3	8	4½	10	3¾	8	3½	11	2	8	4	11	2½	10	2½	12	4	11	....	.....
3	8	3½	8½	3½	10	3½	9	3½	9	2½	12	3½	9	3	11	2	8	3½	9	....	.....
4	12	3	9	3	12	3½	9	2	10	2¾	9	3	8	4	9	3	9	3	9	....	.....
3½	10	2¾	8½	4	11	4	8½	2	12	3½	14	4½	9½	4	9½	3½	9	3½	8	....	.....
3¾	8	2	8	4	9	4½	9½	3¾	8	3	4	4	8	4	8½	4	11	4	8	....	.....
3½	8	4	8	3¾	10	3	10	2½	11	3½	9	4½	8½	3	8	3	8	4	9	....	.....
3½	9	3½	8	3	8	3½	8	3	8	3½	8	2½	8	3	8½	2½	11	4	9	....	.....

Aggregate weight of spleens, 1,066; average, 3 74. Aggregate weight of livers, 2,710; average, 9 51-100.

TEXAN CATTLE—FROM BROADLANDS—ALEXANDER'S.

Dec. 23, 1868.

Spleens and Livers..	4	9	3½	11½	3½	12	3	12	3	11½	4½	12
" ..	3½	12	4½	12	3	9	4½	14	4	11	3½	11½
" ..	3	9	3½	13	3½	10	4	14	4	9	3	9
" ..	3½	10	4	12	2½	12	3	12	3	12	4	8
" ..	2½	12	3	12½	4	6	4½	11	3½	9½	5	13
" ...	4	8	5	14	3	16	3½	13	3½	8	2	12
" ..	3½	16	5½	13	3	11	3½	11½	4	14	2½	9
" ..	3	11	4	8	2	9	4½	12	4	13	4	10
" ..	3	9	4½	8	3½	12	3½	13	3	11½	3	9
" ..	2	11½	4	9	3	10	4	12	3½	13½	2½	8
" ..	3	11½	3	12	3	14	3	11½	3	14	3	14
" ..	3	4	3	11½	3	8	2	9	3	12	3½	13
" ..	4	9	3½	14	3	12½	3½	12	4	11	4	9½
" ..	3	12	3	12	3½	9½	3	10	3½	13	4½	11
" ..	3½	9	3	13	4	11	3	14	3	11	3	12
" ..	4	11	4	16	4½	11	3	8	4½	12		
" ..	4½	11	4½	15	3	11	3	12½	4	13		
" ..	2	11	4	13½	3½	16½	3½	9½	2	9		
" ..	3½	16	3½	13	3	13	4	9	3½	12		
" ..	3	12	4	13	3	14	3½	12	3½	10		
" ..	3	13	3	11½	4½	11½	3	9	3	14		
" ..	4½	11½	3½	14	3	12	3½	10	3½	10		
" ..	3	12	3	8	3	9	3½	12	4	12		
" ..	3	13	3	9	2	11½	4	8	3	13		
" ..	3	14	4	11½	3	11½	3	16	3	10		
" ..	4	11	4½	11	3	11	3	9	3	12		
" ..	3½	13	4	9	4	9	2	11	4½	13		

Aggregate weight of spleens.....514
Average..... 3.426

Aggregate weight of livers.....1709
Average..... 11.39

[APPENDIX TO REPORT VOLUME.]

REPORT

OF THE

INVESTIGATING COMMITTEE

ON THE

HOSPITAL FOR THE INSANE,

MADE TO THE

GOVERNOR OF ILLINOIS,

DECEMBER 1, 1867.

REPORT.

To His Excellency, GOVERNOR OGLESBY:

At the last regular session of the Legislature of this State, the following joint resolutions were adopted by that body—

WHEREAS, There are reports in circulation in the public press and elsewhere, reflecting upon the management of the Hospital for the Insane, thereby tending to injure the reputation of the superintendent, and to impair the usefulness of that important institution; therefore,

Resolved, the Senate concurring, That a joint committee of three from this House and two from the Senate, be appointed to visit the Hospital for the Insane, after the adjournment of the Legislature, at such times as they may deem necessary, with power to send for persons and papers, and to examine witnesses on oath. That said committee be instructed thoroughly to examine and inquire into the financial and sanitary management of said institution; to ascertain whether any of the inmates are improperly retained in the hospital, or unjustly placed there, and whether the inmates are humanely and kindly treated, and to confer with the trustees of said hospital in regard to the speedy correction of any abuses found to exist, and to report to the Governor from time to time, at their discretion.

And be it further resolved, That said committee be instructed to examine the financial and general management of the other State institutions.

In pursuance thereof, the undersigned were, on the 28th day of February last, appointed such committee.

Contemplating the possible contingency that official action in respect to matters covered by the foregoing resolutions might be necessary before the next session of the Legislature, it will be observed, the committee, instead of being required to report the result of their investigations to the Legislature, were directed to "confer" with the trustees of the Hospital for the Insane "in regard to the speedy correction of any abuses found to exist, and to report to the Governor from time to time at their discretion."

It will also be observed, that although the committee are "instructed to examine the financial and general management of the other State institutions," it is only recited that "there are reports in circulation in the public press and elsewhere reflecting upon the management of the Hospital for the Insane;" and it is only with the trustees of that institution that the committee are specially directed to "confer" with reference to the correction of "any abuses found to exist."

Aside from the great interest connected with the management of our other benevolent State institutions, it is not strange that grave charges (founded, it may be in a majority of cases, upon mere rumor or bare apprehension), that the Hospital for the Insane was either negligently or corruptly managed, should result in ordering a prompt and searching inquiry into the truth or falsity of such charges; and especially so when it is considered, as will be shown hereafter in this report, that since the opening of the hospital, November 3d, 1851, and prior to December 1st, 1866, over twenty-five hundred patients were admitted for treatment; that about four hundred thousand dollars had been expended by the State for lands and buildings to establish, and six hundred thousand dollars for current expenses in maintaining this cherished State institution; and that by such munificent appropriations by the people, its capacity had been increased until five hundred of this unfortunate and afflicted class can be constantly provided for, and will soon, at a probable expense to the State of $100,000 per annum, be under its supervision and government.

The State has not only a large pecuniary investment in this hospital, but the most delicate and solemn trusts are committed to those who are responsible for its control. Everything, therefore, concerning its financial, medical, sanitary, or moral government, is not only of absorbing interest to those who may have friends and relatives there, but also to the whole people of the State whose pride it has been to found and support this institution which represents its intelligence and public spirit, and is worthy of a first class American State. And the fact that unusual and peculiar qualifications are required for the proper government and treatment of the insane, in the opinion of the committee, affords no good reason why a rule of strict and even rigid accountability should not be applied to those who have a personal supervision over them, for kindness and forbearance in their government are

demanded alike by the dictates of humanity and common decency. When the committee were appointed, on the last day of the session, no member had, or pretended to have, either any personal knowledge or opinion concerning the merits of the complaints made. As there was no person appointed as agent or allowed to represent the State in the collection of testimony for the consideration of the committee, nor authority given the committee to employ such, they were in doubt what precise course to adopt under the resolutions providing for their appointment. Believing it to be their duty to proceed as early and speedily as possible to ascertain all important facts, they entered upon the discharge of the duties devolved upon them with a most anxious solicitude and hope that without any palliation or concealment of any wrong, a thorough examination of the whole subject might result in a full vindication of the management of those institutions, and an entire acquittal from censure of the Superintendent of the Hospital for the Insane, and those with whom he had been associated.

The committee first met at the Dunlap House, in Jacksonville, on the 14th of May, and after a full and free consultation as to the general duties devolving upon them, and the mode of procedure proper to be adopted, decided to hold their sessions in private and allow no publication to be made of their consultations or the evidence taken until otherwise determined by them. They were aware that secret sessions of public bodies, or persons charged with public duties, are not usually acceptable, and are generally opposed to that spirit of free inquiry common to our people; but they believed that for many obvious reasons no possible good would result from public sessions, provided a full journal should be kept of their procedings, and hereafter submitted to you or made public, as might hereafter be deemed proper; and this policy has been adhered to throughout the investigation. A complete journal has been kept of their proceedings; the testimony has been taken by a stenographer and transcribed and copied; and the same, covering several hundred pages, is submitted as a part of this our report.

The first and chief inquiry was concerning the management of the Hospital for the Insane, and the committee were directed to ascertain—

1st. Concerning its financial and sanitary management.

2d. Whether any of the inmates were improperly retained there.

3d. Whether any were unjustly placed there.

4th. Whether they were humanely and kindly treated.

No formal written charges have been made to the committee against the officers of the hospital, nor any formal defense interposed; but the character of the above inquiries directed to be made, and the testimony which from time to time has been received, substantially disclosed the following issues or points of controversy.

COMPLAINTS.

The principal complaints seem to be—

1st. Extravagant expenditures of money in the management, and a want of proper sanitary regulations.

2d. Retaining patients not insane.

3d. Admitting patients without the proper legal evidence of their insanity—such as a trial and proper certificates and security as required by law.

4th. Abuse of patients by officers and attendants by blows, by neglect, and by appliances not necessary to their proper personal restraint and government, and by an improper association of patients.

DEFENSE.

The defense interposed by the trustees and superintendent, seems to be a general denial of all these charges, and it is insisted—

1st. That the amount expended in the land and buildings is not more than expenditures made in other States according to the number provided for.

2d. That the current expenses of the institution, have been no more than an economical administration of its affairs actually required; that no supernumerary officers or employès have been paid; and that in respect to these expenses they will compare favorably with other similar institutions—and that the sanitary condition of the hospital has been good, except during a part of the time, when, from defective drainage and ventilation, and for which they were not responsible, it has been temporarily otherwise.

3d. That patients have been invariably discharged, upon recovery, or as soon thereafter as their friends or authorities sending them there would remove them; and that incurable patients have

been frequently discharged to equalize representation by counties, and make room for new applicants.

4th. That if any persons have been admitted without a trial of their insanity, they have been married women or infants, who were admitted, according to law in force at the time of admission; and that if any persons have been received without the security required by law, it has been inadvertently done, and not in bad faith.

5th. That proper circumspection has been practiced by the officers, in respect to the selection of attendants who have the principal personal custody and care of the patients, and a rule of unvarying kindness to patients has been enjoined upon them; that, so far as the Superintendent and Trustees are informed and believe, the patients have been generally treated kindly; and that, while there have been instances of abuse of patients, yet they are incidental and unavoidable in their government, and all such as were known have received attention and investigation, and the guilty parties reprimanded, discharged or punished, according as the circumstances of each case seemed to require.

6th. That in the government of the patients, the principle of punishment has been studiously ignored, and only such restraints have been used or imposed upon them as are usual and proper in the other institutions of similar character.

7th. That the association and classification of patients, in wards, as practiced in the institution, is in accordance with the present usage in Europe and this country.

As the principal rumors or complaints were of cruelty to patients, that branch of the subject seemed to be of most importance, and first engaged our attention. But three witnesses appeared at this first session, to-wit: Miss Susan Kane, of Christian county, who had been employed as an attendant in the hospital, from August, 1865, to January, 1866; Mrs. Graff, of Morgan county, who was employed as directress of the sewing room, from July, 1858, to October, 1861; and Mr. E. Searles, of Whiteside county, who was a patient in the hospital from January 1, 1864 to December 30, 1865. These witnesses were intelligent, their deportment under examination respectable, and they appeared to the committee to be entirely worthy of credit. Miss Kane and Mrs. Graff had, from personal observation and experience, full opportunity to know the general treatment of patients, especially in the

female wards, during their residence there; and Mr. Searles testified principally concerning his own treatment.

The testimony of these witnesses was so remarkable in its character, as to excite for the first time, in the minds of the committee, serious apprehensions that a harsh, if not inhumane and brutal policy had been adopted by the officers and attendants in the treatment of patients. And as the names of several persons were pointed out by these witnesses as important witnesses, but whose residences, in several cases, were unknown, it then seemed our plain and imperative duty to advise the public of our meetings, and request that all who knew of any important fact, or who knew the names of those supposed to have information important to the investigation, to inform the committee, and appear and give their evidence.

A circular to that effect was published, subpœnas issued for witnesses whose residences were known, and the committee adjourned on the 16th of May, to meet at Jacksonville, on the 4th of June.

Determined to spare neither time nor labor that might appear necessary to a full hearing of all testimony which might be offered, or which could be honorably procured by the committee, to establish the charges of abuse from time to time communicated to the committee, or for the fullest explanation and defense of those charges by the officers of the hospital, we have found it necessary to hold several meetings. We met the 4th, 5th, 6th, 7th, 8th and 10th of June, again at Jacksonville; July 10th and 11th, at Chicago; on the 17th, 18th, 19th, 20th, 22d, 23d, 24th, 25th and 26th of July, again at Jacksonville; on the 20th, 21st and 22d of August, again at Chicago; and on the 26th and 27th of September, at Springfield.

The committee had hoped they should have been able to close this investigation at their meeting in September, but at that meeting an affidavit was received by the committee, of Miss Julia A. Wilson, charging the superintendent with grave improprieties to her while visiting her sister in the hospital, in July, last. The President of the Board of Trustees and the Superintendent, being informed of the charge made in the affidavit, objected to its being received without the benefit of a cross-examination of Miss Wilson; and after members of the committee had made inquiry of persons acquainted with this lady, concerning her character,

the committee decided to take her testimony, and allow the cross-examination, as requested. After receiving the depositions of several non-resident witnesses, who had been examined on written interrogatories, they made arrangements for taking the testimony of Miss Wilson, in Buffalo, and adjourned, to meet again at such time and place as the chairman should designate.

On the 16th and 17th of October, Dr. McFarland, and Mr. Dummer, his attorney, and the chairman of the committee, took the depositions of Miss Wilson and her mother, Mrs. Julia A. Wilson, and J. D. H. Chamberlain, Esq., before James S. Gibbs, Esq., in the city of Buffalo.

After the taking of this testimony, it was agreed between the chairman of the committee and the counsel of Dr. McFarland, that the examination concerning the hospital should be concluded at Bloomington, on the 12th of November; and the committee met at that time and place for that purpose. At that meeting, however, an application was made by the President of the Board of Trustees, for a postponement, on account of the appearance of a malignant disease then prevailing at the hospital, which prevented Dr. McFarland from being present, and also the unavoidable absence of his counsel.

The committee therefore adjourned until the 29th of November, at Jacksonville, for the purpose of closing the investigation of the hospital, and also to complete their examination of the institutions for the education of the deaf and dumb, and blind. Before doing so, however, they visited the Normal University, and examined the property belonging to the State at Normal, and the financial management of the University.

On the 29th of November the committee again met at the Institution for the Deaf and Dumb, at Jacksonville, and after hearing the balance of the testimony offered by Dr. McFarland, and completing their examination into the "financial and general management" of the institutions for the deaf and dumb, and blind, adjourned on the 3d inst., *sine die*.

The committee believe they have spent no more time than was necessary to a proper understanding of the important subjects under examination; and the delay in submitting to you a report has seemed unavoidable.

A reference to some of the legislation of the State, and some historical facts connected with these institutions, may not be here

improper, as their consideration is necessary to a full understanding of some of the evidence which appears in the proceedings of the committee.

The legislation in relation to the hospital for the insane, and the inquiries directed by the Legislature to be made of its management, and in the order named, will first be considered.

HOSPITAL FOR THE INSANE.

LEGISLATION.

In January, 1847, Miss D. L. Dix presented a memorial to the Legislature containing a very eloquent and powerful argument and appeal to establish a hospital for the treatment of the insane of the State who were believed to be curable; and, no doubt, this memorial, from this renowned and philanthropic lady, and her noble and assiduous labors, had a very proper influence upon that body. At all events, on the 1st of March of that year the original act of incorporation was passed. It appointed nine Trustees to manage its affairs, and provided for the appointment by the Trustees of a Superintendent, Assistant Physician and Steward. The Superintendent was required to be a skillful physician, and was to be appointed for a term of ten years, during which time his salary should not be reduced, and should only be subject to removal for "infidelity to the trust reposed in him, or incompetency to the discharge thereof." He was required to be a married man, and, with his family, reside in the institution. It required the hospital to be established within four miles of Jacksonville, and authorized the purchase or acceptance by grant of not to exceed 300 acres of land, and which land should have upon it a "never-failing supply of water," and be "conveniently situated for necessary supplies of fuel." For the purpose of securing such land, if necessary, and constructing buildings, and meeting such expenditures as might be incidental to the erection and completion of such hospital and appurtenances, a tax on all the taxable property of the State of one-fifth of one mill on the dollar, for the term of three years, was directed. The site was to be selected in three months thereafter, and the trustees were required to "so construct

and complete" said building and out-houses, and improvements, that the same should accommodate 250 patients and necessary attendants, and the whole cost of so doing was limited to sixty thousand dollars.

The act provided that insane patients from the several counties of the State should be in proportion to the population of the same, but that each county should be entitled to send at least one patient. "Indigent persons" and "paupers" were to be charged for medical attendance, board and nursing, the actual costs attending the same, and "paying patients" such sums as the trustees should prescribe. As no provision was made for the clothing of patients by the hospital, such clothing was to be provided by the counties or the patients, or their friends, and therefore, under the eleventh section of this act, neither "paupers" nor "indigent persons" nor "paying patients" *were to be charges upon the institution;* for the two former classes were to be charged the "actual costs" of medical attendance, board and nursing, and the latter might be even charged a profit.

The county commissioners' court were authorized to send insane paupers; the courts of the State those charged with any capital or felonious offense, and who had been found insane by the jury; and the circuit courts were directed, on application of any person, to have one alleged to be insane committed to the hospital, to inquire into the fact of insanity, and if such court should be satisfied that such person was, by reason of his or her insanity, *unsafe* to be at large, or suffering from *unkindness, cruelty, hardship or exposure*, to send such person to the hospital.

These were the substantial and humane provisions of this law. Protection to society from the "unsafe"—relief from "unkindness, cruelty, hardship and exposure," whether in jails, poor-houses, or private families, giving "precedence," however, to the "indigent insane," and "preference" to "recent cases" over those of a "chronic character," seems to have been the leading idea of this first organized and earnest effort of our State in the care of its insane.

In 1849 (February 3d), the special tax provided by the act of 1847, above referred to, was continued another year, and on February 15, 1851, it was increased from one-fifth to one-third of a mill, and continued indefinitely; and the trustees were authorized to use so much of said "fund for the insane," after the completion

of the building provided for in the act of 1847, as might be necessary in defraying the expenses of the institution, *provided* that not more than one hundred and fifty dollars per annum should be used for each "State" patient; and by the second section of this act of 1851, the "costs and charges" of keeping insane persons residing in this State was directed to be paid out of this "fund for the insane." But by the eighteenth section of the law of February 14, 1855 (appropriation act), these laws authorizing the levy of a special tax were repealed, and the special tax levied for 1854 required to be paid into the treasury to the credit of the general revenue fund; and by the second section of the law of February 21, 1861 (appropriation act), the trustees were authorized and directed to collect from such patients as are of "sufficient ability," the just charges for their support, and report the names to the General Assembly, and the sums so collected.

It will thus be seen that the original policy of making the hospital a self-supporting institution, by requiring the trustees to collect either from the counties, or patients, or their friends, the costs and charges for their care and treatment, was changed by the law of 1851 and before the hospital was opened, and "all insane persons residing in the State" were entitled to receive not exceeding one hundred and fifty dollars per annum for their support, out of the "insane fund." This law continued in force until 1855, when so much of it as related to the special tax for the "fund for the insane" was repealed; and finally, in February, 1861, as before stated, the original policy, so far as "persons of sufficient ability" were concerned, was re-enacted, and the trustees directed to collect from such the "just charges" for their support. In other words, the hospital, from its opening, in 1851, to February, 1861, was free, to the amount of $150 per annum; and since then, those able to pay are required to pay, and those not able, including paupers, are supported free, except as to clothing (unless the limitation of $150 remains in force, as applicable to paupers and indigent insane), which by the act of 1851 is required to be furnished for paupers by their counties.

Several other important changes were made in the laws, by the acts of 1851 and 1853, in respect to the power to commit to the hospital. The fifth section of the act of 1851 conferred *concurrent jurisdiction* upon the county courts to hear and determine alleged cases of insanity, and the order of the court, or judge, or

a copy thereof was required to be furnished to the trustees, and should constitute the authority to *receive* and *detain*. The 10th section of this act has been the subject of much comment and discussion, both in and out of the Legislature. It provided that married women and infants, who, in the judgment of the medical superintendent, were evidently insane or distracted, might be received and detained in the hospital on the request of the *husband*, or the *woman*, or *parent*, or *guardian*, of the infants, without the evidence of insanity or distraction required in other cases.

This action in relation to married women and infants was substantially re-enacted February 12, 1853; but the judicial proceedings required before committal of *others* were changed. The county courts were vested with *exclusive* jurisdiction to try cases of insanity; and before any person could be committed (married women and infants excepted, and those previously legally decided to be insane), some respectable person was required to file a written statement with the county court or judge thereof, in vacation, setting forth that the person was insane, and that it was for his or her benefit to be committed to the hospital, and giving the list of witnesses by whom the facts could be proven. It therefore became the duty of the court to summon a jury of six, one of whom should be a physician, to try the question of insanity. The jury were, in case they found the person insane, to return a prescribed form of verdict, and the insane person, under certain regulations and limitations, was to be committed to the hospital.

Neither the law of 1845, or that of 1847, or of 1851 or 1853, required the person alleged to be insane to be present in court during the examination; and, prior to the act of 1847, there was no trial of the fact of insanity provided, except a person had property or was accused of crime. The medical evidence required by the court (one juror required to be a physician), as well as the testimony of other witnesses, were under these various laws accepted in lieu of the presence of the person alleged to be insane. The court or jury would, however, probably have had the right to have such person produced before finding him or her insane, but such presence was not required by the law.

Conceiving, probably, that persons not insane might be improperly committed and detained in the hospital under these laws, and who might be protected from such illegal committal if required to be personally present during the examination of their cases, and

that married women and infants were as much entitled to the protection of the law in respect to their personal rights in this regard as others, the Legislature, on the 16th of February, 1865, again conferred upon the circuit judges of the State the same powers as then possessed by the county courts in this respect, and declared that no resident of the State should thereafter be admitted into the hospital "except upon the order of a court or judge, or upon the production of a warrant issued under the provisions of this act of 1853;" and, also, "that no trial should be had of the question of sanity before any judge or court without the presence or in the absence of the person alleged to be insane."

The subject of illegal committals and detentions in the hospital was again before the last Legislature; and, by a most stringent law, of March 5, 1867, it was declared, that any superintendent, medical director, agent or other person, of any hospital or asylum for insane or distracted persons in this State, who should receive, keep, or detain in any such asylum or hospital any person against his or her wishes, without the record or proper certificate of the trial of such person alleged to be insane, as required by the act of 1865, should be deemed guilty of a high misdemeanor, and on conviction be punished by a fine of not less than $500, nor more than $1000, and imprisoned not less than three months, nor more than one year, or both, in the discretion of the court before whom the conviction should be had.

This law of March 5, 1867, further provided that any person then confined in any insane hospital or asylum, and all persons confined in the hospital for the insane, at Jacksonville, who had not been tried and found insane or distracted by the verdict of a jury, as provided in and contemplated by the act of 1865, should be permitted to have such trial; that all "such persons" should be informed by the trustees "in their discretion" of the provisions of both these acts, and on their request such persons should be entitled to such trial within a reasonable time thereafter, provided that trial might be had in the county where such insane person resided previous to such detention, in case such person or his or her friends should within thirty days after such demand for a trial provide for the transportation of such person to said county; and in case no such provision for transportation should be made, then such person should be tried in the county where he or she was then detained. The fourth section also provided for the dis-

arge of all such persons who had not been tried as provided by
e act of 1865, or who should not be so tried within two months
om the passage of the act of 1867.

A question arose under this last law as to whether, in cases
ere the patient was so palpably and obviously insane as not to
capable of knowing whether they wanted a trial or not, the
stees had any discretion in the premises; and the supreme
urt, on a case instituted, decided, that, irrespective of their
ntal condition, *all* patients in hospital March 7, 1867, who had
t been tried as provided by the act of 1865, must be tried or
scharged, and that the trustees had no discretion, but were
und to provide them a trial.

By the act of February 13, 1857, the number of trustees is
duced to six, the office of steward abolished, and the duties of
at office to be discharged by clerks appointed by the trustees on
e recommendation of superintendent; insane paupers required
be furnished with clothing by their counties; form of complaint
d verdict of insanity prescribed; trustees authorized to dis-
arge any patient when, in their judgment, it is necessary; in-
rable and harmless cases to be discharged, to make room, when
cessary, for recent cases; and non-resident patients who were
obably curable, authorized to be received; and the compensa-
on of trustees to be their personal and traveling expenses going
and returning from the meetings of the board.

A careful examination of these various laws, will show:

1st. That a full and fair trial by a court and jury is now se-
red to every person alleged to be insane, and he or she not only
rmitted but *required* to be personally present during said trial,
d a certified copy of the verdict of the jury required before
mission to hospital.

2d. Representation by counties according to population, each
nty, however, to be entitled to at least one patient; and,
ong different applications from the same county, the "paupers"
"indigent insane" to have preference over "paying patients;"
the "recent cases," or those deemed curable, over "chronic
s," or those deemed doubtful or incurable.

3d. Counties to pay expenses of pauper patients to hospital;
ish certain articles of clothing for them in advance, and pro-
suitable clothing while there, and remove them when required
the trustees.

4th. Patients of "sufficient ability to pay the just charges of their support," including, undoubtedly, medical and other attendance.

5th. Plenary powers conferred on trustees and superintendent to equalize representation, enforce payment, and compel obedience to all laws and regulations of the institution.

6th. The institution a hospital for treatment of cases probably curable, instead of an asylum for helpless or incurable—with this limitation, that each county only is entitled to one patient, whether incurable or not.

7th. Admission of non-resident curable cases when there is vacant room.

FINANCIAL AND SANITARY MANAGEMENT.

The *condition* of the hospital, including its costs, is perhaps necessary to be understood in determining its "financial and sanitary management."

It appears from an examination of various reports of the trustees and superintendent, and books and records of the institution, that there has been expended by the State, for lands and buildings for the hospital, the following sums:

In 1847–48	$13,121 54
1849–50	36,815 93
1851–52	44,014 28
1853–54	36,801 37
1857–58	71,055 33
1859–60	79,500 00
1861–62	26,110 67
1865–66	75,814 00
	$383,233 12

Of this amount $3,631 42 was expended, in 1847–48, for land and $10,000 00, in 1861–62, for water-works; and $814, in 1865–66, for land; making $14,445 42 for land and water-works, and leaving $368,787 70 as expense of buildings. To this sum should be added, as appropriated February 28, 1867, $16,400 for completing and furnishing the east wing, re-painting, finishing chapel, and enlargement of sewers and cess-pools—making the sum total for lands and buildings $399,633 12.

It further appears that the following sums have been appropriated and expended for its support:

In 1851-2	$25,165 64
1853-4	62,329 36
1855-6	65,000 00
1857-8	72,000 00
1859-60	80,000 00
1861-2	88,750 00
1863-4	90,000 00
1865-6	55,000 00
	$538,243 98
To which should be added—appropriated February 25, 1867, to meet deficiency for current expenses for year 1866	63,206 53
Making the total amount of current expenses to Dec. 1, 1866	$601,450 46

The general account will then stand:

Lands and building	$399,633 12
Current expenses to 1867	601,450 46
	$1,001,083 58

It also appears that the following number of patients have been admitted prior to July 1, 1867:

Number admitted from Nov. 3, 1851, to Dec. 1, 1864	2,135	
Number admitted from Dec. 1, 1864, to Dec. 1, 1866	446	
		2,581
Number discharged (*recovered*) prior to Dec. 1, 1866	1,054	
Number discharged (*improved*)	229	
Number discharged (*unimproved*)	650	
Number discharged (*by friends*)	48	
Number discharged (*eloped*)	35	
Died	246	
		2,263
Leaving in hospital Dec. 1, 1866		318
Admitted from Dec. 1, 1866, to Feb 28, 1867	56	
Admitted from Feb. 28, 1867, to April 3, 1867	23	
Admitted from April 3, 1867, to July 25, 1867	111	
		190
		508
Vacancies from Dec. 1, 1866, to Feb. 28, 1867	40	
Vacancies from Feb. 28, 1867, to April 3, 1867	29	
Vacancies from April 3, 1867, to July 25, 1867	103	
		172
In hospital July 25, 1867		336

As 2,581 were admitted from Nov. 3, 1851 (at opening of hospital) to Dec. 1, 1866, and the total expenditures for lands, buildings and current expenditures to Dec. 1, 1866, was $1,001,083 58, it will be seen that it is equivalent to about $388 per patient.

And $601,450 46 being the amount of current expenses to same date, it will also be seen that such expenses are equal to about $233 per patient.

From the report of the superintendent, of Dec. 1, 1864, it appears that there were then in hospital 301; and, from his report of Dec. 1, 1866, there were at that time in hospital 318.

The treasurer's report for Dec. 1, 1866, shows that there was expended on account of current expenses, for 1865 and 1866, $187,921 30, or $93,960 65 per annum. Assuming the average attendance during those two years to be 310 patients, the *gross* expense *per capita* was about $303. But it is also stated in said treasurer's report that $52,790 31 was received by the hospital for clothing and incidental expenses of patients during said time. This latter item seems to be a mistake, as the amount received for board is only $31,054 01, and for clothing $21,736 30—making $52,790 31 on both accounts. And it also appears from said report of the treasurer, that said expenses includes $8,218 62, as expenses of "farm account;" and that $9,251 57 was received during the same time, on account of sales made of surplus hay, corn, hogs, and cattle from the farm; therefore the $9,251 57 should be added to the above $52,790 31—making $62,047 88, which, deducted from the above $187,921 30, leaves $125,873 42, as the amount actually expended *by the State* for current expenses in the support of these patients—which is equal to $62,936 71 per annum, or about $203 per patient per annum, *by the State*.

On the 28th of February last there were seventy officers and employés (including four patients) in the service of the hospital, at a monthly compensation of $2,039 14; and the amount paid on account of salaries, for quarter ending March 3, 1867, was $5,301 84. These persons are:

1 Superintendent, whose monthly salary is	$208 33
1 Assistant physician, whose monthly salary is	70 00
1 Assistant physician, whose monthly salary is	50 00
1 Chaplain	25 00
1 Matron	20 00
1 Clerk	58 33
1 Supervisor	40 00
2 Supervisoresses, each	20 00
1 Seamstress	20 00
1 Engineer	58 33
1 Assistant engineer	58 33
1 Fireman	30 00

10 Male attendants, each	$30 00
14 Female attendants, each	15 00
1 Barber	35 00
1 Cook	45 00
1 Assistant cook	30 00
1 Baker	40 00
1 Watchman	35 00
1 Porter	35 00
1 Farmer	58 33
1 Gardener	35 00

25 Employés of various kinds, with various salaries—from $10 00 to $35 00 per month.

These officers and employés reside at the hospital, and the salaries are exclusive of their board, washing, etc. The salaries and wages do not appear unreasonable for the grade of services, although, in some cases, they are higher than are paid in other similar institutions. The aggregate salaries and wages, according to number of patients, do not materially differ from amounts paid in several other institutions, whose reports the committee have examined; and the committee are satisfied from the testimony, that there cannot at present be any material reduction of salaries or wages.

The following is a statement of amounts paid for the same services, and included in current expenses, for the past ten years:

Years.	Salaries.	Wages.	Total.	Per Annum.
1857 and 1858	$6,100 00	$16,471 67	$22,571 62	$11,285 81
1859 and 1860	5,937 59	18,362 97	24,300 47	12,150 23
1861 and 1862	6,153 84	20,165 29	26,319 13	13,159 56
1863 and 1864	8,815 60	23,384 27	32,199 87	18,099 93
1865 and 1866	.....	.....	43,983 14	21,996 57

LANDS.

The "lands and buildings and water-works" for which the above expenditure of $399,633 12 has been made, consists of a farm, lying adjoining the city of Jacksonville on the south, of 160 acres of land—well fenced, and under a high state of cultivation; and about —— acres occupied by a reservoir. The lawn, garden, and land occupied by the various buildings, contain about forty acres; about fifty acres are in crops, and about seventy acres to tame grass. Almost everything has been done to make it in every sense a model farm. Its natural beauty, its admirable and

convenient locality, and the contributions which science and good husbandry have made, render it altogether one of the most productive and valuable farms in the State.

The superintendent, in his report, says that this farm "is, as heretofore, a source of pleasure and unquestionable profit. That it is a source of 'pleasure' to many—that the 'household supplies drawn from it, in all their freshness and convenience,'" are desirable; in fact that the farm, or some portion of it is really a necessity, the committee do not doubt; but it does not appear, from the treasurer's report, quite so clearly that there is in this farm a source of pecuniary profit to the State.

As the farm seems to be well managed, and no extravagant expenditures are shown in its expense account, and a great portion of its products are needful to supply the tables of the hospital, it is not necessary to enter into a close calculation of its pecuniary profit or loss to justify the investment. The committee are inclined to think, however, that the north sixty or eighty acres might be now very advantageously sold, in small lots, at the present value, without interfering with any necessity or convenience of the patients; and the proceeds of such sale either used in improvements upon the balance, or re-invested in other cheaper lands, near or adjoining the hospital farm.

BUILDINGS.

The buildings, costing as heretofore stated, $601,450 46, consist of the hospital, and other buildings necessary for its use—including a barn and outbuildings upon the farm. The hospital, as now completed, with a front of five hundred feet, is of brick, and consists of nine sections or sub-divisions. The centre or main building is 100 feet front, by fifty feet deep, with a basement of eight feet; and three principal stories of eleven feet each, and an attic of eight feet. This part of the hospital is occupied for offices, and domestic and household purposes. Joined to it are two wings on the east, known as the east and new east wings; and two wings on the west, known as the west and new west wings, but now forming, in fact, but two wings—the east and west wings. Each of these wings, *as last mentioned*, is composed of two lateral or longitudinal sections, and two transverse sections. Each of the first lateral sections has seventy-three feet front, and is thirty-six feet deep; and each of the first transverse sections

has a front of twenty-eight feet, and is 100 feet deep; and each of the second lateral sections is fifty-seven feet front, and thirty-six feet deep; and each of the second transverse sections is forty-three feet front, and 100 feet deep. The transverse sections correspond in height with the lateral sections—except, in the former, there are attics, used as dormitory wards; and the lateral sections are three stories above the basement. For convenience, as well as architectural appearance, the first lateral sections fall back about thirty feet from the front line of the main building; and the second lateral sections about twenty feet from the first. The front line of the first transverse section of each wing, falls back about thirty feet from the front line of the main building; and the front line of the second or last transverse section of each wing, falls back about twenty feet from the front line of the main building. The basement and three principal stories throughout the building, are of corresponding height. Each floor or story of each wing, as originally constructed, and as *first above* described, is occupied as one ward. Therefore there are sixteen full or regular wards, and four dormitory wards. Through the centre of these wards there are halls, 100 feet long and twelve to fourteen feet wide. On each side of these halls are sleeping rooms. In the new wings these rooms are fourteen by ten feet, and in the old wings twelve by twelve feet. Opening out of these wards are, also, convenient reception and dining rooms. In each ward there are also a water-closet and bath-room. In July last the average number in each of the twelve wards then occupied was twenty-eight—the four wards in the new east wing were then being completed, and not occupied. The west wings, except the basements, were occupied by female, and the east wing and basements by male patients. The three basement wards, being known as the first, fifth, and new fifth, in July contained seventy-five male patients. There were twenty-nine in the old fifth, and thirty in the new fifth; and it seemed to the committee that these wards should be either abandoned as wards, or so re-constructed as to afford more light, and better ventilation. These were occupied by the worst patients, who seemed to be necessarily suffering for the want of sufficient light, and pure air.

The want of proper provision for heating and ventilating these old wings, and especially these basement wards, is on account of the bad construction of the flues in the brick walls; and the foul

air flues in that connection appear but little better than none; and the remedy for which is in constructing more and larger flues, for the admission of fresh and the discharge of foul air.

The grounds in front of the hospital descend to the north, and several acres are tastefully laid out in flower-beds and lawn; and a highly cultivated and very productive vegetable garden and grapery lie in the rear.

The committee spent nine days, in July last, in the hospital, in taking testimony, and inspecting the buildings and premises, and they take great pleasure in saying that, so far as they were able to observe, the sanitary condition of the hospital was, with the exception above named, all that could be desired. The patients appeared to be well provided with plenty of plain and good food; they were comfortably and neatly clad; the machinery and apparatus for cooking, washing and heating, and ventilating the building, appeared admirably adapted to the purposes intended; and the building throughout seemed a model of cleanliness. In the thorough inspection which the committee endeavored to make, they were accompanied by Professors Patterson, of Batavia, and Johnson, of Chicago, who were summoned by the committee to assist them in the personal examination of the patients, which will be mentioned hereafter. The testimony of these gentlemen, on this and other subjects, will be found in the journal of the committee.

In passing through the various departments of the hospital, one of the most noticeable things which attracts the attention of the observer, is the admirable system there adopted for warming and ventilating the entire edifice. After various changes, which time and experience have shown necessary to be made on this important subject, the present system of *forced ventilation* and warming by steam—and as it seems, in perfection—is in operation.

Immediately in the rear of the hospital, but in their uses forming a part of it, are suitable buildings of brick, two stories high, containing a kitchen, bakery, wash, ironing, drying, boiler, and engine rooms, and sitting, dining and sleeping rooms for employés; and in one of the wings is a chapel, now being completed under the appropriations last made.

From one of these rear buildings, and connected there with five steam boilers, each twenty-four feet long and forty-four inches

in diameter, there runs a large steam pipe of wrought iron through a subterranean channel of brick-work, five feet in diameter, to the center of the main edifice, and there, dividing at right angles, passes each way through the cellars, and again branching to supply the transverse wings at the extreme portions. Connected with these main pipes are smaller pipes, one inch in diameter, which enter into two rows of hot-air chambers. These hot-air chambers, made of wood and lined with zinc, have a direct communication at the bottom with the fresh air outside the building, and which is admitted through windows in the cellar walls, and at the top discharged into flues which rise into the various wards occupied by patients. Connected with these pipes in these hot-air chambers, is a circuit of pipes, which fill the chamber, heating the air within it to a high temperature. The fresh, cold air on entering these chambers is heated, and rising with a strong current through the flues, is distributed through registers, as required. The surplus steam and water of condensation, in passing back toward the boilers in another set of cast iron pipes, is made to ascend to the center building of the hospital, and from there distributed, in coils of pipes, to the halls, dining rooms, parlors and offices; and having performed its office there, and being condensed to water by its use, is conveyed back to the building where it was generated, and by a steam pump thrown into the boilers, to be again sent on its endless circuit.

In addition to the ordinary means of ventilation, there is placed at the mouth of the large subterranean channel before-mentioned, a circular fan, fourteen feet in diameter, and driven by a steam engine. When in motion, this immense fan gathers up fresh air, and forces it with such rapidity along the pipes through this subterranean channel and up the flues in the building, that in a very short time every particle of foul or hot air can be displaced by this current of fresh air. A special means of very thoroughly ventilating the privies and water closets has been produced by connecting them, a few feet above the outlet at the bottom, by a subterranean channel of brick work, with the chimney stack, standing at the end of the building which contains the steam boilers. This chimney stack is 115 feet high, and in it is a cast iron smoke flue, three feet in diameter; and between this iron flue and the brick work which surrounds it, is a space one foot in the clear, and connected with the subterranean channel last mentioned; and

thus an active, upward current of air is produced by the heating of this air in this foul air flue in the chimney stack, and not only the foul gases of the vaults escape, but a downward current of air from the privy rooms is produced when the seats are opened.

When it is considered how important a proper system of heating and ventilation is, in a large hospital like ours, both to the health and comfort of the patients, the people of the State, instead of regretting, may well congratulate themselves that their liberal and generous appropriations have been made to supply every needed physical comfort to these patients. And the only object the committee had of specially referring to this subject in this report, was to show that almost every requisition for money to extend the capacity and comfort and usefulness of this hospital, has been promptly met. While this is true, however, there are a few other changes and expenditures, which it seems to the committee are of pressing and vital importance.

These rear buildings, where almost all of the fire in the institution is used, are connected with the main building of the hospital by an "arcade," or passage way of wood, two stories high. It is of lattice work, and answers for no other purpose than a covered passage between these buildings, unless it should unfortunately prove to be a magazine to fire the whole buildings. So eminent did the danger from this combustible structure, in case of fire, appear, that the committee immediately called the attention of the trustees to the subject, and advised its immediate removal. In view of what might otherwise appear an apparent neglect, it is but proper to state that the trustees and superintendent have called the attention of the Legislature to the subject, and asked for an appropriation to replace this "contrivance" with a substantial brick structure, but for some unknown reason, the appropriation has not been made. The committee also understand that the trustees intend to remove it at an early day.

Another subject intimately connected with that of FIRE is that of WATER; and although neither of them, in the relation here mentioned, may come strictly under "financial and sanitary management" of the institution, yet their importance may justify the reference which is here solely made for the purpose of calling your attention to what the committee think you may regard an appropriate subject of executive recommendation.

There seems to have almost always been more or less difficulty of obtaining a sufficient supply of water for the hospital. Indeed, it would seem that, before the location of the hospital, such difficulty was apprehended; for, as has heretofore been shown in this report, the trustees were required, before accepting any grant of land as a site for a hospital, to see to it that said land should "have a never-failing supply of water on the premises." The trustees, in their report of December, 1860, very justly say that the importance of this instruction seems to have been overlooked; that the hospital grounds have no supply of water, except from cisterns and wells; that during the (then) past dry season, and at other times, a great portion of the water used has been hauled from a distance; and that in consequence of such scarcity, "less water has been used for bathing and other purposes than the health of the patients required." To remedy this difficulty, Mr. Chesbrough, an eminent hydraulic engineer, was consulted, who estimated that at an expense of ten thousand dollars a reservoir could be excavated on the bluff, or north bank of the Mauvaisterre creek, and about one-third of a mile from the hospital—with a top water of level 62 feet above the bed of the creek, circular in form, 201 feet in diameter at top water line, 152 feet at the bottom, with bank ten feet wide and two feet above top water line, and side slopes two feet horizontal to one foot perpendicular—giving a depth of twelve and a half feet of water, and with a capacity of 2,500,000 gallons of water; and the water to be raised from the creek into the reservoir by a steam engine and pumps, and conveyed by pipes into a large cistern, containing a week's supply, at the hospital. This reservoir, it was supposed, would hold a five months' supply, and thus afford a protection against droughts. The appropriation was promptly made—the work completed and put in operation about February 1, 1862. Since that time, until the present season, there has been no serious inconvenience from a want of a sufficient supply of water, although the loss by "seepage" through the bed of the reservoir has been greater than was expected.

During a part of the present season the supply of water has been cut short, and for the past two months most of the water used at the hospital has been drawn by teams from wells and cisterns in the vicinity, and even in that way but a scanty supply could be procured. The drought the present season has been the

principal cause of this, although the reservoir is out of repair. The result of this state of things has been an increase of sickness among the patients. An epidemic among them, and a panic among the attendants, were very eminent during a part of last month. The crisis seems now to have passed, for the late rains have given some relief. Still, serious embarrassments for the want of sufficient water still continues; and from all the information the committee can obtain, it is not improbable that additional measures will have to be adopted to secure a permanent supply. A survey has recently been made, under the direction of the citizens of the city of Jacksonville, with reference to constructing a large reservoir near the hospital reservoir, and it is supposed a permanent supply of water can be obtained from Mauvaisterre creek. If this plan should be successful, the hospital may be supplied in this manner.

The fearful and positively alarming condition of things at the hospital in case of fire, and no adequate supply of water and apparatus to extinguish it, would be too appalling to admit of description. A hospital in flames containing hundreds of insane and distracted patients, in their various wards, and perhaps in their beds, at the mercy of this remorseless element, and no effective instrumentality to protect or save them, would present a scene of horror which few eyes ever beheld. And yet the danger of just such a frightful calamity has existed during a part of the present season. Even with no lack of water in the cisterns, there is danger in case of a fire. Dr. Gilman, whose attention was was called to this subject, testifies that if a fire should break out, they have *very* limited means to put it out—nothing but pails and the employés about the institution. He says that they have a hose which might be used, from the engine house, but don't think it could be used extensively; that there is no organization of the employés as a fire company; that there are five or six buckets to each ward; but that the utmost caution is taken to guard against fire; and that the wooden arcade or corridor above mentioned, is to be removed when means are furnished to remove it.

True, the hospital has never been in flames, but to guard against such a contingency and provide for it if it should occur, it seems to the committee that hose running from the water tank in the attic into every ward and hall, should be put in, so that in case of fire the whole building could be immediately flooded; that the

employés should be organized into a fire company, and occasionally drilled in their duties; and, in the opinion of the committee, nothing less than these precautionary measures would relieve the anxiety of the people of the State, and especially those who have relatives or friends among the patients, and who are, or may become aware of their exposed condition. A few hundred dollars thus expended, it is thought, would be a better investment than money paid by the State to insure these buildings.

In relation to the support of the institution, ever since the law of February 21st, 1861, it is evident that a more stringent rule must be adopted under that law, or its main dependence will continue to be upon appropriations. In this connection it will be recollected that the law provides that board and attendance shall be furnished to paupers at the expense of the State, the counties or towns sending them to provide clothing; but as to those formerly called "paying patients," and indigent insane and not paupers, it is otherwise. Under the law of 1861, "authorizing and directing" the trustees to collect from such patients as are of "sufficient ability" the just charges of their support, the trustees have assumed that the law now recognizes three classes of patients, to-wit: "paupers," "indigent insane," or those not paupers but unable to pay for their support, and those of "sufficient ability." In their report of December, 1862, they say the task of "discrimination" and "determining the question of ability," is a difficult one; that the friends of some of the patients misrepresent in order to escape liability; that others, in their anxiety to have a patient received or retained, promise readily a remuneration, when a thorough investigation shows that they ought not to be charged, and that not more than three dollars per week in any instance is required to be paid. This sum has since been increased to a maximum of $5 per week. In practice, this responsibility is imposed upon the superintendent, and the committee are informed by him that no regulations have been adopted requiring proof to be made touching the ability of the patient or his friends, but that after hearing the statements of the friends of the patient, he decides whether the patient is able to pay any, and if so, what amount—a practice, it seems to the committee, not only attended with difficulty, but liable to abuse.

The report of the superintendent of December, 1864, shows there were then in the hospital, December 1st, 1862, 302; that

during the two years ending December 1st, 1864, there were admitted 408; and there were discharged and died, during the same period, 409; leaving 301 there December 1st, 1864—showing an average attendance during said two years of about 300. The current expenses during the same time was $132,753 18, or $61,376 09 per annum, being $204 58 per annum of gross expense for each patient. But $14,185 00 was received for board of patients, and $22,734 87 for clothing furnished: total, $36,919 00, which deducted from above $132,753 18, leaves $95,833 31, or $47,916 65 per annum, and which is equal to $159 72 per annum for each patient. Or, deducting still further, $5,899 51, as received from farm during said two years, would show annual net cost *to the State* of $149 88 per patient. Referring to the gross and net costs for 1865 and 1866, heretofore stated, it will be noticed that the expense or gross costs of supporting each patient was $303 09, showing an increase in 1865–6 over 1863–4 of $98 51. The *net costs* for 1865–6 per patient was $203 19, or an increase of net expense of the later over former term of $53 31 per patient annually. Amount of salaries and wages for 1863–4 was $31,499 87, and for 1865–6 $43,983 14, or an increase of $12,483 27. The increase of admissions during the latter period is thirty-eight, and discharges and deaths twenty. As there were 301 in hospital December 1st, 1864, and 318 December 1st, 1866, and the average attendance during these four years is not given, an approximate estimate only can be made from the above data.

Sundry exhibits referred to in the testimony are transmitted with this report. An abstract of exhibit "B," and other statistical information, and marked schedule "B," will be found in the journal of the committee, containing the number of paupers in the hospital February 28th, 1867, from each county; the number from each county whose friends became security, and the population of each county, according to the census of 1865. Out of the 336 then in hospital, 139 were paupers.

As to representation, the committee have not been able to see that any unfair discrimination has been made in admitting patients from the several counties in the State. But one serious complaint concerning representation has been made to the committee, and that is made by Judge Bradwell, county judge of Cook county. His complaint is not that Cook county has not had her proportion of patients admitted, but that patients (besides married women

and infants) have been habitually admitted from that county without the trial and verdicts required by law. A reference to the testimony of Judge Bradwell will be necessary to a full understanding of this complaint; and the committee cannot doubt, in the absence of explanatory testimony, that the irregularities complained of to some extent exist. The admission of Mr. McCormick, of Chicago, mentioned by this witness, was without doubt, in violation of law. But as Mr. McCormick occupied rooms, during the month he and his wife and servants were in the hospital, which were usually occupied by the superintendent and his family, and the institution received a very liberal compensation for his treatment, it is believed that there was no improper motive in receiving him, although a practice of that kind could not legally be justified. The testimony of Judge Bradwell is very positive that many persons, not married women or infants, previous to the passage of the law of 1867, were admitted from Cook county without a trial and verdict of a jury; that many of them were paupers, and that when bills were sent for clothing furnished them, he had an examination of the records made, which showed this state of facts. On the cross-examination he was asked if there had not been some arrangement with the agent of Cook county and himself, by which paupers from the Cook County Alms House were sent to the hospital, and he answered that he never made any such arrangement, and was the last person to make an arrangement with any body to send persons to the hospital without a trial. In consequence of this practice, the witness said persons who had been regularly tried and found insane, were refused admittance because the quota of Cook county was full on account of those irregular and illegal admissions.

ARE PATIENTS IMPROPERLY RETAINED.

The next inquiry directed to be made was whether any patients were "improperly retained" in the hospital. Under the provisions of the law of March 5, 1867, known as the "personal liberty" law, the trustees of the hospital were directed, as before stated, to inform all patients who were in the hospital, and who had not been tried and found insane, or distracted, by the verdict of a jury, as provided by the law of 1865, that they were entitled to such trial, and that unless they should be thus tried and found insane or distracted, within two months after the passage of said

act, they should be discharged. Understanding that this law was being executed by the trustees, the committee deemed it but respectful to them to await the conclusion of the trials contemplated by that law, and therefore postponed the personal examination of patients until their meeting in July.

It appears from a statement, made by the trustees to the committee, of such trials, and the record and proceedings thereof, that there were 212 patients in the hospital who were tried by jury in May, under the supervision of the trustees; that verdicts of insanity in each of them were rendered, and that there were in the hospital about 125 in addition, who had been tried by jury previous to their admission to the hospital. The committee supposed that the law of March, 1867, had been fairly and impartially executed, in respect to these trials, yet as these recent verdicts included but a part of the patients, it of course was the duty of the committee to make the examination, as directed by the Legislature; for they were directed to ascertain whether the inmates were "improperly retained," and that involved the question of the insanity of all of them. The committee, therefore, on the 24th, 25th and 26th of July, made a personal examination of every patient in the hospital; and in that examination were assisted by Drs. Johnson and Patterson, as heretofore mentioned. The manner of the examination, and the testimony of these gentlemen, and also the testimony of other witnesses, will be found in the journal of the committee. It may be proper here also to state that, in this examination, every patient whose insanity was doubtful, as well as many cases of those who appeared harmless and incurable, were noted for particular subsequent inquiry, and a special examination of witnesses, touching such cases, was made.

There were then in the hospital 170 male, and 166 female, patients. All but about fifty or sixty were so manifestly insane as to require but a moment's notice. There were several convalescent patients, and a few probably wholly recovered, but retained, as was stated and believed, awaiting their friends to remove them. It was the opinion of Drs. Johnson and Patterson that none of this number were, upon the ground of their sanity or insanity, "improperly retained" there; and in this opinion the committee, although having no professional knowledge as experts, concur.

It appears, however, from the testimony of Dr. Dutton, the first assistant physician, that about one-half of this entire number are

incurable, and it was evident to the committee that many such were harmless.

It also appears, from a list of discharges furnished the committee by the superintendent, that there were 127 patients discharged between February 28th, the day the committee was appointed, and July 24th, the day of the commencement of inspection of patients, being about five months. During the two years ending December 1, 1866, the number discharged, for various causes, was 609, or about 25 per month. The number discharged during the above five months is about at the same rate. The number discharged on account of *recovery*, however, during these five months, was 60, or 12 per month; whereas the number discharged for same cause during said two years was 146, or only about 6 per month. This increase in the rate of *recovery* is a little noticeable, but in the absence of proof to the contrary, the committee are bound to suppose the fact incidental, and not the result of a policy to make rapid discharges to avoid examination.

UNJUST COMMITMENTS.

The committee were next specially instructed to inquire whether any of the inmates "were unjustly placed there." There has been no evidence received by the committee that there were any patients in the hospital February 28th or July 24th, 1867, who were not at the time of their admission insane; and the question as to whether patients were "retained" there who were supposed to be sane, has already been briefly considered.

If by the term "unjustly placed" there, as used in the resolution, is meant whether persons were placed there who were not at the time insane, then, in the absence of evidence to the contrary, the presumption is that no such cases exist. If, however, it is meant whether any patients who were in the hospital February 28th were received without the presentation to the superintendent, at the time, of the evidence of their insanity, and security for their support or removal, as provided by law, or who had been committed by the husband or guardian subsequent to February 16, 1865, without complying with the provisions of that law, then the answer must be in the affirmative; because it appeared, from a careful examination of the papers on file, that of 205 patients in hospital April 3, 1867, who had been admitted since the passage of the law of February 16, 1865, the papers in

but 57 were regular and complete; and yet it did not appear, from any information the committee received, that it was certain that after the passage of said law any persons were committed who were not in fact tried as required by the law; but it did appear that 148 were admitted without the proper *legal evidence* of their insanity, and the security required by law. Doubtless there are occasional instances where a strict compliance with the law on this subject, at the time of the arrival of the patient at the hospital, would be almost impracticable, if not apparently inhuman; but that there should appear so large a proportion of the admissions in violation of law, shows a carelessness on this subject without excuse, and deserving of censure.

It also appears, from a statement of the superintendent, that the whole number of married ladies admitted prior to February 16, 1865, under the act of 1853, was 603, and that the number of married ladies admitted since February 16, 1865, and prior to December 1, 1866, is 107, or about 28 per cent.; that the whole number of infants admitted prior to February 16, 1865, was 79, and since February 16, 1865, and prior to December 1, 1866, was 44.

The irregularities in admitting patients, above mentioned, do not exclusively relate to informal papers, or a want of proper evidence of the insanity of patients before admission, or the proper and formal security required by law in certain cases, but extend to cases where no trial was required, by law, as in case of married women. Without a special enumeration, two cases on this point will illustrate the evils which might grow out of a disregard of the law, as it formerly existed, without a trial. One case was that of a lady, Louisana Rittenhouse, who had been in the hospital since March 10, 1865, and who was understood to be a married woman. The only paper on file, or which had been on file, as authority for her admission, was a statement from some gentleman (who was certified, by a justice of the peace, to be a physician) that he thought the lady insane; but who brought her there, or whether he died afterwards, or was still living, or whether the patient then was, or ever had been, a married woman, did not appear, either from papers or the recollection of any one in the hospital.

The other case was that of a Mrs. Julia Gritzner, of Will county, who was brought to the hospital March 17, 1864, by her son, and discharged April 8, 1867. Mrs. Shedd testifies that she

was a very lady-like person, and very quiet, and was accustomed to follow visitors to the door, and inquire about her friends. Mr. Morrison, one of the trustees, and Mr. Dummer, counsel for trustees, in a report made to the trustees June 13, 1867, concerning the trials under the law of 1867, heretofore referred to, say "that Mrs. Gritzner was brought to the hospital under the law of 1853, by her son; that certain parties, not her relatives, were anxious to take her away, but her son remonstrated, and she, remaining insane, was detained in the hospital; that, subsequently, her son consented to her removal; that about five weeks prior to June 3, 1867, some of the parties interesting themselves in her case came to take her away, and her son having in the meantime consented, she was allowed to be taken away; that it appeared that the parties had a writ of *habeas corpus*, but no objection having been made the last time to her removal, the writ of *habeas corpus* was not used, and was understood to be abandoned."

Grave suspicions from reputable sources have reached the committee, touching the motives of the son, now reported dead, in causing his mother to be sent to the hospital; but as no intimation has been made that the superintendent of the hospital was a party to any intentional wrong, and Mrs. Gritzner was discharged before the committee visited the hospital, they have not investigated the case further than to show that she was committed to and detained in the hospital in flagrant violation of law. Even the law of 1853 did not authorize a son to commit his mother to the hospital without the verdict of a jury of her insanity. It only authorized a *husband*, with the approval of the superintendent, to commit, and that power or right would cease on the termination of the marital relations by death or divorce. Assuming—and the committee understand that to be the fact—that Mrs. Gritzner was insane, it does not relieve any parties from deserved censure who were instrumental in commiting or detaining the patient there without a trial; and on this point the committee would only add, that if such abuses have been tolerated, whatever difference of opinion there may have been at the time, touching the stringent provisions of the law of 1867, and the necessity of repealing the law of 1853, there ought not to be any controversy now on that point, and the law of 1867 should afford a source of sincere congratulation.

TREATMENT OF PATIENTS.

The next and last specific inquiry the committee are required to make, is whether the inmates are humanely and kindly treated. Have the patients in the hospital been "humanely and kindly treated?" And if not, upon whom does the responsibility of a want of such treatment rest? These are the most important and vital inquiries relating to this investigation, and the committee have pursued them with a painful consciousness of the responsibilities which they owed to the people of the State, in ascertaining by personal examination and proof the real facts on this subject. It would be a waste of time and a mockery of solemn duty to *argue* the proposition that the patients of an insane hospital are entitled to humane and kind treatment on the part of those who have the custody and care of them, or that it would be a violation of one of the highest and holiest public obligations, knowingly to retain any man or woman in charge of them who should be habitually forgetful of the solemn duties imposed upon him or her; to protect and not smite; to sympathize with and not offend; to even cherish and not outrage and abuse this most unfortunate class of our fellow citizens.

Assuming, therefore, that the pitiable condition of these dependent and defenceless patients would almost surely afford them constant protection against intentional neglect or habitual abuse, the committee, in examining witnesses on this subject, has been constantly disinclined to believe, without the most convincing proof, that any person could be capable of such neglect and abuse. And it was mainly in view of the fact that severe public condemnation would rest upon any one, and especially upon any officer of the hospital who should be shown to be responsible for abuses of this character, that the committee decided to afford every opportunity for explanation or defense against such charges. The superintendent in person, as well as his counsel and one or more of the trustees, have been present at the meetings of the committee, and a patient and protracted examination of witnesses has been allowed, and the committee are confident that no mere technical rule or objection has been adopted to prevent the fullest investigation into the truth.

The patients are governed and disciplined by the following officers and employees—

1. The superintendent, who is the chief executive officer of the institution; who is authorized to appoint and exercise entire official control over all subordinate officers and assistants in its service. He prescribes the duties of these assistants, and is required to see them faithfully performed. He is given entire supervision of the patients in their medical, moral and physical treatment; and it is made his duty *to visit the patients in their wards* as frequently as may be necessary to keep himself fully advised of their condition.

2. Two assistant physicians, whose general duties are declared to be: to prepare and superintend the administration of medicine; to visit the wards frequently, and carefully note the condition and progress of the patients; to see that the directions of the superintendent are executed, and promptly report any cases of neglect or abuse that may come under their cognizance; and, in case of the absence of the superintendent, the senior shall exercise the duties of such superintendent.

3. A matron, who, under the general direction of the superintendent, has charge of the domestic concerns of the institution, and an oversight of the female attendants and domestics. Among various other duties, she is required to make daily inspection of the wards and rooms occupied by female patients; to have special care of sick female patients; to reprove, or report to the superintendent, any material departure from rule, and to spend as much time in the wards of the female division as may be necessary to see that the female attendants discharge their duties.

4. One male and two female supervisors, whose general duties require them to have an oversight of the sick; and, under the direction of the superintendent, assistant physicians and matron, to see that the rules prescribing the duties of attendants towards the patients are faithfully observed. They are required to spend their time chiefly in the wards, and *to report to the superintendent* any attendant who wilfully violates the rules, or whose incapacity is obvious.

5. Twelve male and fifteen female ATTENDANTS, having charge, under their superiors, on the 26th of July last, of twelve wards, containing 170 male and 166 female patients. These attendants (usually two to each ward) occupy rooms in the wards, and their place of duty is in the wards with their patients.

These officers and employees are the constant and active governing force. The by-laws and regulations adopted in September, 1857, and approved by Governor Bissell, and now in force, it seems to the committee, constitute, upon the whole, a wise and humane code for the government of the hospital. They strictly enjoin kindness and forbearance towards the patients. The following extracts are taken from these regulations:

"In dealing with patients, the greatest care should be used that they be always treated with unvarying kindness. They should always be addressed in persuasive language—all authoritative expressions being strictly avoided. In the wards, especially, no commands should be used, or calls uttered to a patient from a distance, if possible to be avoided. All threats, taunts, or other kind of abuse in language, are expressly prohibited; and no one will be retained in service who habitually indulges therein. A blow, kick, or any other form of physical abuse inflicted, will be sufficient reason for the prompt dismissal of the individual so offending."

"An attendant shall never, under any circumstances, use greater force toward a patient than is sufficient to secure the patient, himself, or others, from the effects of his violence. After he is secluded in his or her room, the supervisor, or some superior officer, in his absence, should be informed of what has occurred."

Copies of these regulations are required to be kept in each attendant's room, and in each employee's dining-room; and it is shown to be the custom of the superintendent to occasionally read them to all the attendants and employees, assembled together for that purpose, and specially comment upon those portions of them which enjoin kind treatment to the patients.

Notwithstanding, however, these duties of kindness to patients are by these regulations required of all, it has not escaped the attention of the committee that, while it is made the duty of the assistant physicians to "promptly report any cases of neglect or abuse that may come under their observation," and the matron is required to "report to the superintendent any material departure from rule, or anything censurable in moral deportment," and the supervisors are required to report to the superintendent "any attendant who willfully violates the rules, or whose incapacity is obvious," yet, by omission or design, the attendants are neither

required or permitted by these regulations *to report each other's delinquencies* to the matron, supervisor or superintendent; and the evidence shows that, by some employees at least, it was well understood that such reports would not find favor.

It cannot, in the opinion of the committee, be pretended that the *practice* of cruelty by attendants towards patients is encouraged, or, as a policy, sanctioned by the officers; nor, can any possible motive be imagined why it should be; for, to suppose that brutality is encouraged, is to assume either that the government of the patients can be more easily administered by converting the hospital into a house of torture, and, therefore, the policy adopted as a mere matter of convenience, or, that the officers permit abuses for the mere gratification of depraved and abandoned hearts. No such motives can be justly ascribed these officers; and, whatever abuses are or may be found to exist, must be the result of causes growing out of the government of men and women. As they are in palpable violation of established and well understood printed regulations, they must originate from, or their repetition, at least, be attributed to a want of rigid discipline over the attendants. and that constant care and watchfulness on the part of the officers so indispensably necessary in such an institution.

It is not, however, of so much importance to ascertain motives or causes, as facts; and, while a careful examination of the whole evidence on this branch of the investigation is necessary to a full understanding of it, the committee would respectfully call your Excellency's special attention to the testimony of Miss Kane, Mrs. Graff, Capt. John Henry, Miss Kee, Mrs. Bland, George Merrett, John C. Edmunson, Mrs. Cassell, and Mrs. Packard. The testimony of these witnesses, as of all others examined, is, as already stated, included in the journal of the committee, and submitted as a part of this report, and will not be here repeated; but reference to the character of these witnesses, and the substance of their testimony, may not be improper.

As the testimony is in writing, and is to be considered by others, without the opportunity of personally hearing and seeing the witnesses, it is proper here to say, that all the witnesses, with, perhaps, two or three unimportant exceptions, who were examined, were of more than ordinary intelligence, and appeared candid and eminently worty the fullest credit. It is true that there are some

discrepancies or contradictions in their testimony, but the most of them are upon collateral or unimportant matter; and none, with the exceptions alluded to, in the opinion of the committee, of so serious a character as to involve the integrity of the witnesses.

Miss Kane testified, that she was 44 years old, resided in Christian county, and was an attendant in hospital from about the middle of August, 1865, until the latter part of December, of the same year. When she went there Dr. McFarland told her he wanted her to assist in taking charge of a ward, then in charge of an attendant who, although not officially reported to him, yet he knew she was cruel to patients. He told her she would hear a great many hard stories about the institution, but she must not believe a word of them. A Mrs. Dorcas Ritter was the co-attendant of witness, in the new 8th ward; and the first thing witness noticed was the cruelty of this Mrs. Ritter to the patients. Mrs. Ritter would not let them sit down, and if she found them so sitting, she would take them by the hair of the head and lift them on the seat, and if they resisted she would often shove them back against the wall and choke them, or compel them in some harsh way to comply. The benches in the ward were straight backed and hard to sit upon; and Mrs. Ritter told witness, that if she allowed the patients to sit upon the floor and rest them, that Dr. McFarland would be mad, and which witness subsequently found to be true. This Mrs. Ritter, for a slight offense upon the part of the patients, would give them what was called a cold bath, which punishment consisted in putting the patients in a bath tub, half or two-thirds filled with cold water, their hands and feet tied, and if they resisted, a straight jacket was placed upon them, their heads plunged under the water as long as it was safe to leave them, then lifted out for a few moments to allow them to breathe and cast the water from their stomach, and the same process continued as long as the patient was thought able to bear it.

Witness further swore, that this Mrs. Ritter told her she came near killing a patient named Miss D. Haven, and that Dr. Dutton, who chanced to be passing shortly after, observed that the patient looked sick, and on being informed that Mrs. Ritter had been giving her a bath, the Doctor told her how long it was safe to keep them under water, and if they kept them in until they vomited, there was danger of their dying. Witness further stated that in giving patients these baths they were generally plunged

three or four times, until quite prostrate and unable to resist. Miss Kane stated that this Mrs Ritter remained in the institution about three or four weeks after Miss Kane went there, but that before Mrs. R. left, she administered these baths three or four times to different patients; and that Mrs. R. told her that the attendants were not allowed to administer these baths, without instructions from the Doctor, but that they sometimes did do it without such instructions, and the Doctor knew it; and that the Doctor and Miss Belle Bailey and Mrs. Haskett set them the example of giving the patients these baths, and "breaking them in," as they called it. Miss Kane swears that the patients were sick for several days, and sometimes two weeks, after receiving these baths.

Witness also swore that her ward was the new 5th, and was made up of some of the hardest and most obstinate cases from the other wards; that she saw this Mrs. Ritter frequently jacket and beat patients; that at one time, during witness' stay in the institution, eleven patients were sick with flux in her ward, and that they were not furnished with medicines, nor she with any extra help or nurses, and that four of them died; that she, witness, made no complaints to Dr. McFarland of these abuses, because it was understood in the institution that such complaints would receive no attention.

It was undertaken to be shown, on cross-examination of this witness, that she herself was guilty of abuse to patients. She admitted that on one occasion, a stout and violent patient, a Mrs. Ryan, made an attack on an attendant, and she assisted to control her until assistance could be procured from another ward, and that during the struggle, she, witness, "spanked" the patient with her shoe; that she thus used her shoe on one or two other occasions; and that she once tapped this same Mrs. Ryan on the shoulder with the broom; and that she sometimes was obliged to take patients by the hair of the head to hold them; but she denied ever having been cruel, or injuring patients, although she claimed that although attendants ought not to be allowed promiscuously to strike patients, yet it might be sometimes properly done conscientiously, but not to injure them.

Witness also mentioned another case of a Mrs. Magin, who was indecently treated by Mrs. Haskett. Soon after she entered the institution, Mrs. McFarland (who, from the evidence, appears to

have been a most kind and spmpathetic lady) told witness that the patients were not being kindly treated, and that there must be a change, as the matter was getting out and would damage the institution.

Mrs. Graff, (formerly Mrs. P. L. Hosmer,) testified that she resided near Jacksonville; was fifty-two years old; and the letters published in a pamphlet shown her, signed P. L. Graff and P. L. Hosmer, were written by her and were true; that she was acquainted with Dr. McFarland when he had charge of a similar institution in New Hampshire, and at his solicitation entered the service of the hospital here, in July, 1858. She was directress in the sewing room about four years and half, and left October 10, 1861. Witness testifies generally that the discipline of the institution was too harsh and unnecessary for its government, and that she had frequently known of cruel punishments inflicted upon patients; that the cases were so numerous that she did not pretend to remember them all. She expressed the opinion, as did Miss Kane, that she did not believe that these cruelties were at the direction, or, at the time, with the knowledge of Dr. McFarland, whose general instructions to the attendants were to treat the patients kindly. She, however, mentions one most remarkable exception, where the punishment was inflicted by his own direction. The testimony in relation to this and other particular cases, which are charged against Dr. McFarland, personally, will be stated together hereafter.

Mrs. G. swears to the punishment of a Miss Jane Barackman, by shower-bath, for improper conduct to an attendant. The patient had been taken out of the water, and was just able to speak. At another time this same patient was strapped with her hands behind her back, in the morning, and the straps kept on until the next morning, and her groans during the night kept the witness from sleeping; and the witness further states, that she had known instances where the straps had been drawn so tightly as to cut through the skin, and into the flesh. Another instance named was a *new patient*, on the night after arrival, whom the witness thought, from the sound of the voice, was being choked by two attendants. She told Mrs. McFarland of it, who informed the Doctor. The Doctor went into the room where the patient was, and, after staying some time, came out but did not speak to witness. The next morning she asked the Doctor if what she

said about choking the patient was a lie, and he said "no," but it was best to say nothing about it, as one of the attendants was going away, and it would hurt the institution to have it go out. Another case was that of Mrs. Farenside, who was sitting down, on a certain occasion—the Doctor said he was "cooling her off," and directed witness not to go to her. Another case was that of Mrs. Boyce. This was a very emaciated patient, and "her stomach all crushed in as it were." She was a wild patient, and would tear up and take off her clothes, but witness could always manage her better than others. Witness had seen her sitting day after day with her feet tied; and on one occasion she and Mrs. McFarland found her in the screen room, laying on her back on a hard pallet of straw, with her feet tied, and her hands tied behind back with a large bed-cord, and just alive. She had a straight-jacket on, and the jacket was laced up with ropes as large as bed-cord. The witness held the light and Mrs. McF., manifesting her grief in groans, untied the patient. Witness afterwards showed this jacket to Miss Dix, when she was there, and the pattern of the jackets were afterwards changed, and softer cords used in lacing the jackets.

Witness John Henry, who has resided in Jacksonville, about forty years, and was a member of the State Senate when the act of incorporation was passed, in 1847, and afterwards steward of the hospital, about one year, from 1848 to 1849. His situation made him acquainted with the general treatment of patients; and knew of cases of cruelty and inhuman treatment to them.

One case was an Englishman, whose name he does not remember. Said he had, on one occasion, returned from down-town, and was standing outside of the building, and heard a distressing voice in the second ward, and went into the building and found the patient in the hands of two men holding him on his back, and the third man standing on the bathing tub and pouring water in his face and nose from a pail. The patient was struggling and strangling for breath. The witness rescued the patient, and drove the attendants from the room, and reported the case to Dr. McFarland. He subsequently called the Doctor's attention to the case, with the view of having it investigated, and had a Mr. Crandley do the same. Being satisfied that the case was not investigated he reported it to Mr. Stephenson, the president of the board, and told him if such things occurred again he would make

complaint to the grand jury. He says he frequently heard of other cases of cruelty, from persons employed about the building. Witness thinks Dr. McFarland is destitute of common sympathy to the patients, and did not listen to their complaints with kindness; nor give that personal attention to the conduct of the attendants which was necessary to a personal knowledge of their treatment; and appeared indifferent when complaints of cruelty were made to him.

Miss Jennie Kee, who is 24 yeas old, resides in Jacksonville, and was an attendant from the spring of 1861 to 1862. about 14 months; swears to a case of cruelty (about one month after she went there) to a patient named Anna Myers, by an attendant named Elizabeth Bonah. The attendant took the patient, who was a very insane and idiotic patient, by the hair of the head and pounded the floor with it. She saw this punishment inflicted several times. Also knew of same attendant punishing a Mrs Thompson by taking her by the hand and twisting her arm; and a Miss Kate Daly, by striking her hands with keys, leaving marks. Also a Mrs. Loop, by same attendant, by pulling her and putting her wrist out of joint.

This Elizabeth Bonah, who appears from the testimony of several witnesses, to have been a merciless and brutal wretch, was in the institution as an attendant when this witness went there and when she left.

Mrs. Sarah Bland, aged 39 years, and a resident of Jacksonville, was attendant from March, 1863, to October, 1865, (a part of the time was in sewing room,) and had opportunities of knowing the general treatment of patients; swears that the first two years that she was there, and while Mrs. McFarland was matron, the patients were treated kindly. About seven months before she left, Mrs. McFarland, who was the matron, left the institution and went east and returned in the spring, but was not able after her return to act as matron. After Mrs. McFarland left, the witness saw patients treated very cruelly. This witness mentions the abuse of Mrs. Eames, who was a very stupid, quiet and delicate looking patient. In the spring of 1865, the witness heard screams in the bath-room. A Miss Kate Snow came out of the room and inquired for the Doctor, and said that Miss Lawrence, the attendant, had Miss Eames in the bath-room and was beating her brutally. Witness went into the wash-room, and, on coming out,

heard the blows, and then went into the ward, when Miss Lawrence came out of the bath room and locked the door, and said witness could not have any patients out of that ward. In the evening witness saw Miss Eames in bed, and told witness, her eyes filling with tears at the time, that Miss Lawrence had almost killed her, and asked to look at her back, which witness was prevented from doing by Miss Lawrence, who came in and told witness to go out of the ward—that she should not come in and excite the patients. Witness had three patients to go out of the ward into the sewing room; and Miss Lawrence took them by the back and pushed them violently into the ward. The patient died one week after the morning she was pounded.

The next was in the spring of 1865. A Mrs. Sutton, who was not a violent patient and seemed to be in good health, was punished very badly by two attendants—Mrs. Lydia Riggs and Miss Bell Bailey—and was confined to her room for two weeks after her punishment; at the expiration of which time the witness saw her, when the patient's face was a dark green color, without any natural flesh except around the mouth. (This Miss Bailey is still retained, and is supervisoress in the hospital, and denies that punishments are ever inflicted in the Hospital, or that she ever, intentionally, injured a patient.)

The next case mentioned by this witness was that of Maggie Rowland, in the summer of 1865. The witness heard a struggle in the bath room and attempted to go in, but was prevented by Miss Bailey, who was in the room, and put her foot against the door and shut it. The witness stayed near by for some time, and heard brutal blows administered to patient. The patient was kept in the bath room for some time after. In the evening witness saw her, and her face was badly beaten up; and on being spoken to by witness the patient cried and looked as though she had no friends. This patient, who was lame, was a talkative, noisy person, but did not appear to be violent. The witness says that the reason she did not tell the Doctor was, that she was afraid of getting into a scrape if she told, for the Doctor had, before this, told her he did not wish to have her make any mischief by getting up excitement among the patients she was with. She says she afterwards, however, did report a case to the Doctor, and he told her to mind her own business, and she after this did not report other cases to the Doctor because of this conversation.

The last case which this witness mentions was that of a Mrs. Clark, who had been sick sometime in bed, and as the attendants were dragging her to the bath room, she asked them not to take her there, but to let her die where she was. As they raised the patient to put her in the bath tub, she dropped down dead. The names of these attendants are Miss Mary Rice and Miss Mary Smith.

George Merrick, aged forty-five years, and residence Jacksonville, was an attendant in hospital from February to June, 1866, and testifies to the abuse of Jacob Myers, a young patient, by the supervisor Mr. Doane, who, without provocation, caught him by the ankles when he was undressing and threw him on the floor and injured him severely. Also David Ayers, a very docile man, and consumptive and sick and feeble, who, the witness states, was neglected by Dr. Dutton and refused medical treatment, and soon after died. Also, David Smith, about twenty-six years of age, a patient who was very bad and crazy. One day witness heard a loud noise in the ward where Smith was, and looking into the ward he saw the attendant, William Roy, jamming his head against the ceiling. Smith made no resistance, but his nose bled and his eye was black. Also a patient by the name of Creighton, who was a small Irishman about twenty-five years old. Witness one day saw him on a bench, and he was wholly speechless—could not move his head; was swollen and was badly bruised. Akers, the attendant, told witness that the patient was a bad man, and they had a hell of a time w th him. Witness that night helped the patient to bed on the floor, and the next night he died. Witness says that he did not know of any medical attendance or medicines furnished him, and he should have probably known it if they had. Witness assisted in laying out the patient, whose head and face were very much swollen; was black under the eyes and on the cheek bones; there were bruises about his arms and shoulders and other parts of his body, and had a wound on the face. The patients informed witness that a few days before this, James Akers, Thomas Kearney, John Doan, (supervisor,) John Roy and William Roy, (employés of the institution,) had beat the patient.

Another case was a wild young patient by the name of Veach, who escaped; was retaken, and on arriving at the hospital,

knocked Mr. Supervisor Doan down (Mr. Doan was about twenty-one years old; had only six months experience in the treatment of the insane, and yet was made supervisor over four wards, containing over a hundred patients, and was a short time before introduced to the institution by Ebenezer Jones, the farm steward of the institution, who received a letter of introduction from Daniel M. Jones, of Wisconsin, who married Mr. Supervisor Doan's sister,) with a brick in again making his escape. On being taken he was handcuffed; his feet shackled; put in a crib and put up in one of the bed rooms of the third ward, where he was kept about three months. The crib was made of strips of plank about three and a half inches wide and two and a half inches apart, and was about two feet high, five and a half feet long, and two and a half feet wide. The witness says the patient could not be in any other position in the crib but on his back; that there was some bedding in the crib, and he thinks, a pillow under his head.

This witness says he had difficulty with Akers and Doan about their abusing the patients cruelly, and he supposes he was discharged on that account. When enquired of by Dr. McFarland if he had not been taking liquor the evening of the difficulty with Doan and Akers, he said he had not; that he was not in the habit of drinking liquor, and resented any such imputation; that he was sometimes, (by permission,) absent Saturday evenings at the choir meetings, and on Sunday and Wednesday evenings at the prayer meetings; and that his character was established and well known in the community.

John C. Edmundson, aged thirty-five years, was assistant engineer in hospital from April, 1861, to October 2d, 1865; testified that before he had been there a week he saw a patient knocked down by Joseph Tinker, an attendant, with a stick, because he absent-mindedly picked a thread out of his coat. Witness proposed to report the case to Dr McFarland, but Eastman, the principal engineer, who had been there three years, told witness he had better not report it if he wanted to stay in the institution. The patient on being knocked down seemed perfectly dead; was not able to get up; had no government over himself, and was taken away and put in the screen room.

The next case mentioned by this witness was George Richards, a patient of Jacksonville, who was kept in the screen room entirely

naked, in the cold winter; and when witness came to work in the morning, to raise steam, at one, two or three o'clock, patient would beg for warmth. It was about fifty feet from screen room to bath-tub, and the attendants would take the patient by the heels and drag him over the floor. One day, as they were about to bathe this patient, witness says, they had drawn the tub full of hot water and had him up in their arms ready to plunge him in the tub, when another patient, by the name of Cooper, jumped in and saved him. Witness says this patient was kept in the screen room the most of the winter of 1863–4; that the room had nothing in it, except sometime a little straw, a straw tick or blanket, which he would tear up and wrap around him for warmth. This patient died the summer or fall after this confinement.

Mr. Haitt of Chicago, was also kept in a screen room almost constantly, and beat and bruised until his limbs were swollen. He was jerked and jammed until his legs were almost a perfect jelly. He went home and came back. Witness heard him speak very kindly of Mrs. McFarland for doctoring his limbs after they were bruised. The two attendants in the ward who abused this patient were Germans. Patient complained that these attendants would not give him anything; and if he asked for anything they would beat and kick him; and witness has given him water, put through the window. When patient left the institution the second time, he said, if he ever came across the attendant who abused him so, he would kill him, if they hung him for it. The witness gave the names of the German attendants who abused the patients, as Pepenbring and Smultz, and said they both resided in Jacksonville.

This witness said that he did not believe Dr. McFarland approved of these abuses, and that the reason he did not report them was that he was afraid if he did he would lose his place. When he talked with the Doctor about business, he got a very short answer, or a nod of the head; and he came to the conclusion there was not much satisfaction. He left the institution because he got tired of it—requested to be relieved several months before he left, but the Doctor requested him to stay.

Mrs. Mary Cassell is 24 years of age, and has lived in Jacksonville 8 years; was employed in hospital from April, 1860, to May, 1861, as assistant matron, and filled the place now called supervisor. Does not personally know of any case of abuse which she

saw administered. Remembers the case of Mrs. Farenside, a patient who appeared one morning at the breakfast table in 5th ward (the worst), after having been removed from the 7th (the best), with a black eye. Inquired the cause, and patient and Elizabeth Bonah said that Dr. McFarland struck her. One eye was black, and one side of her face was very much bruised and blacked for several days. After these bruises were inflicted, the patient was taken from the best ward (the 7th) to the new 5th, which was unoccupied, and confined in a room by herself. Never knew the patient to be boisterous, and think if she had been unmanageable she would not have been in the best ward. Patient and Elizabeth Bonah both told witness that Dr. McFarland kicked her.

Witness then testified that she thought the patients ought to be more kndly treated generally; that many times, when they were sick and feeble, they were prevented from taking proper rest during the day on their beds—it was the practice of the house not to allow them to lie down during the day-time, and the idea advanced was that the patients did not know when they needed rest—that they were inclined to lie down more than was good for them; and it was a most universal complaint in the female wards, on the part of those who were too feeble and weak to sit up, that they were not allowed to lie down in the day-time—remembered one particular case where the patient was ill and wanted to lie down, and her attendant, Miss Eagle, said no, the Doctor did not allow it, and the face of the patient, witness well remembered.

These eight witnesses, in their testimony specially above referred to, have described particular and atrocious abuses, by attendants, to over twenty different patients, whose names are given; and the most of the cases are mentioned by them with circumstantial minuteness. The names of eighteen different attendants are mentioned by them as being engaged in these cruelties The most of them are of comparatively recent date; and they are within the recollection of witnesses now living and accessible.

MRS. PACKARD'S CASE.

The committee would not here specially refer to the testimony of any other witness concerning the abuse of patients by attendants; but, as the name of Mrs. Packard has become very familiar to the public through her published letters and personal efforts to

secure a change in the laws of our State, in relation to the trial of patients alleged to be insane, before their commital to the hospital, it seems proper that her case should be here noticed. It seems to be very generally supposed that these charges of abuse rest principally upon her testimony; and, hence, the question of her sanity or insanity is supposed to be of vital importance in this investigation. Not so; as a careful examination of her evidence will show that she has particularly mentioned but a few such cases; and, therefore, the charges of this character might stand or fall, so far as this investigation is concerned, without reference to her testimony. Her connection with the general purposes of the investigation, however, and other matters contained in and relating to her testimony, does, in the opinion of the committee, render it proper that her testimony, and relations to the hospital and its officers, should be here fairly stated.

Mrs. Packard is a lady fifty years of age; is the wife of a clergyman; and prior to her being committed to the hospital had resided with her husband for some time, at Mantino, Kankakee county, in this State. She is a lady of very considerable culture and of decided ability—was admitted to the hospital on the application of her husband, June 18, 1860, and was discharged by order of the trustees, June 18, 1863, as incurable, or not recovered. She was admitted without a trial of the question of her insanity, under the law of 1851--re enacted in 1853, heretofore referred to. She states in her evidence that the charge of insanity was based wholly upon a change in her religious views, from the Calvanistic to the more modern and more liberal views, as taught by Rev. Henry Ward Beecher. She says that when she was eighteen years old she had an attack of brain fever, and was very much reduced by bleeding and medicines, and was out of her head for about five weeks, until the blood had time to form and give her strength; and insists that during her entire stay in the hospital she was entirely sane; and that her incarceration there was an outrage upon her rights and liberties, and the law (since repealed) which permitted her husband to place her there, without a trial, was a disgrace to the State. She says that for the first four months she was treated with respect and kindness, but at the expiration of that time, with no change in her deportment, and on account of having presented Dr. McFarland with a written reproof for his abuse of his patients, she was removed from the

best ward to one of the worst wards—the eighth, where the most dangerous patients were confined, and where, for two years and eight months, and until she was discharged, she was kept—subjected to the most constant surveillance, (not being permitted during the whole time to go out of doors,) annoyed and abused by both attendants and patients. The last eight months, however. she says she spent pleasantly, on account of some of the most noisy and boisterous patients being exchanged for a more quiet class, and because when she saw the commencement of difficulties she could go to the Doctor, and have them stopped.

The sufferings which this lady endured, and the scenes through which, according to her statement, she passed for two years after her transfer to the eighth ward, are almost beyond comprehension and belief. She says the attendants were instructed to treat her just as they did the maniacs; that she was compelled to sleep in a dormitory with from three to six crazy patients, where her life was exposed both night and day, with no room of her own to flee to for safety from their insane fights and dangerous attacks; that she had been dragged around this ward by the hair of her head by the maniacs—had received blows from them that had almost killed her; that her seat at the table was by the side of a Mrs. Triplet—one of the most dangerous and violent patients in the ward, who frequently threatened to kill her when she went to the table; that she had to dodge the knives and forks, and tumblers and chairs which have been hurled at her, to avoid some fatal blow; and that she had begged and besought Dr. McFarland to remove her to some place of safty, only to see him turn speechless away from her.

Mrs. Packard mentions the abuse of a Miss Rollins by her attendant, Mrs. DeLeHay, by choking and wounding her throat; another case of a lady-like, quiet and submissive patient, about sixty years old, who was punished frequently, (for an unavoidable offense,) by a plunge-bath, until the patient said they nearly killed her, and only wished they had quite, for there was no escape for her from that horrible punishment; also of a Mrs. Goldsby, who had fainting-fits, and was not treated medically by the Doctor, and who one night fell from her bed on the floor and broke her collar-bone, and received for several days no treatment from the Doctor, although he was notified of it.

Such is a part of the graphic description given by this witness of scenes which she swears she witnessed—and of her own sufferings, and that of others.

Mrs. Packard says she was finally discharged, under the following circumstances, and about which there seems to be no controversy: About eight months before she was discharged she was brought before the trustees, and informed that her husband, who was present, had been heard by them concerning her detention, and that she could be heard also. She then read a paper to the trustees, which she had prepared, entitled "Calvinism and Christianity Compared." She also read another paper, which severely reflected upon Dr. McFarland and her husband for confining her in the hospital; and after answering questions put to her by the trustees, the Doctor and her husband withdrew, and she was informed by the chairman that they would do for her anything she wished. She said she wanted her liberty, and *protection* in that liberty. They informed her that they thought it would be no use for her to go to her husband, but she could go to Mantino, or might go to her father in Massachusetts, and they would pay her expenses there. She told them that as she was still Mr. Packard's wife there was no use in accepting their offer, for as soon as she was outside the walls he had the power and would use it to imprison her again. They then told her they did not know what to advise her, and would refer the whole matter to the Doctor and her to settle. She therefore declined to go, but requested a key or pass, and to be allowed to remain as a boarder. This was refused her, and she went back to her ward.

About six weeks before she went away, her son came to the hospital, and the Doctor informed her she could go. She went down town with her son, who informed her that he had made arrangements with her husband for her liberation, provided he, the son, would support her. She was then writing a book, and requested her son to make arrangements for her remaining at the hospital as a boarder for about six weeks, until she could complete it, after which she thought she could support herself, by a sale of her book. She returned to the hospital from down town, and remained there about six weeks, during which time she was made comfortable, and her room furnished with a carpet, by order of the Doctor. At the end of six weeks she received an order of the trustees, from Dr. McFarland, that she would be discharged on the

18th of June, into the hands of her husband. On that day her husband came for her, and she protested against going with him, with her liberty still exposed. The order of discharge was executed by Dr. Tenny, Assistant Physician, (Dr. McFarland being absent) and the porters of the hospital took her from the hospital, against her will, to the omnibus, and there delivered her to her husband.

This witness was subjected to a most searching cross-examination, and re-examination with the view not only of testing the accuracy of her memory, but the soundness of her mind, and the views she entertained on religious subjects; and it is but the truth to say that she sustained herself with great ability in all respects, although she may entertain views upon theological topics about which there are various controversies. But there was one unfortunate matter, which came out on the cross-examination, which the committee feel to be their duty to refer to here particularly. It is unfortunate because its presentation involves a flagrant violation of the spirit of the regulations of the hospital, and of good faith; and because, unexplained or not fully understood, it reflects seriously upon the witness, if sane at the time, and perhaps even then is justly liable to be understood in a different sense from that the witness swears it was intended.

It appears already that the witness, during her stay in the hospital, was engaged in writing a book. She swears that she commenced writing it in September, 1862, and it is evident she was very anxious about completing it, as by its publication she hoped to be able to support herself when she might be discharged from the hospital. Eight months before her discharge, or about October, 1862, she had the interview with the trustees, referred to, when she refused their proffered discharge because of her fear of being again arrested by her husband; and she says after that time she was well treated, and felt she had a superintendent who would listen to her when she asked favors for the patients; and that he had promised to publish her book when completed, and that on the fulfillment of that promise "hung all and every hope of her personal liberty." About the 19th of January, 1863, she says he refused to publish the book, and almost in a state of desperation she made an appeal to the Doctor, which is contained in her letter of that date, and found on pages 94, 95 and 96 of the journal of the committee. At first this letter appeared to the committee to

be a brazen offer of marriage by a married lady to a married man; and was either the production of a diseased and disordered intellect, or a degrading invitation or proposal of illicit intercourse. Whether it be either, or not, it is but just to the witness that her full explanation, found on pages 139, 140, 141, 142 and 143, and her answers to questions of the committee, should be read and considered together. To say the least, it seems to the committee an indiscreet and foolish letter—open to severe criticisms, if not condemnation—written, it is true, under circumstances of overwhelming grief—protesting, it is true, that she must not love his person so long as that love was claimed by his wife—protesting, it is true, that it was as a *true woman* she addressed him—yet mentioning him as one she had chosen as her *protector* and *future husband*, and finally closing by speaking of her son, who would be of age in a short time, and with whom she desired to go as her protector, and take charge of her children. This letter, especially, since her present avowal of it as containing nothing improper, seems a curious medley; and although from the appearance of the witness—her character as a lady, and the entire absence of any intimation from any source against her integrity—the committee have no doubt that she is a virtuous lady, still the letter is an unfortunate and foolish letter.

It seems to the committee that upon one point in connection with this letter there can be no doubt, and that is as to the culpable impropriety of its introduction in evidence. It was not necessary to prove or disprove any charge made against the management of the hospital. Mrs. Packard was not on trial as to her sanity; and if she were, it can scarcely be possible that the trustee who requested Dr. McFarland to produce the letter, would have considered this letter, written in 1863, as sufficient evidence upon that point to establish her insanity—especially after the prompt and intelligent manner in which she had previously testified. Her character as a virtuous lady was not involved, for no one had or has intimated to the committee there was any doubt about that, (unless the letter be deemed evidence to the contrary) and even if that matter had been in doubt, the witness had not charged upon Dr. McFarland any attempt at improper liberties with her, and therefore this letter could not defend him by showing any willingness on her part to receive improper attentions from him of that character In either view of the case, therefore, the

committee cannot but regard the production of this letter as an unnecessary and wanton attack upon a defenseless lady, because she had become identified with complaints made against what she regarded as unjust laws, then in force, and of which she claimed she had been a victim; and had made complaint against the management of the hospital, under the charge of one she addressed under the sacred seal of confidence in him as a gentleman, and under a most solemn injunction of secrecy, because a construction, as she says, might be put upon it prejudicial to her character as a virtuous lady.

And, besides, a part of section 4, chapter 10, of the printed regulations of the hospital, reads as follows:

"Persons employed at this institution will remember that their duties are peculiar and confidential; that there is an obvious impropriety in disclosing the names, peculiarities, or acts of its inmates. * * * * They should not forget that the most cruel wounds may, by imprudent disclosures, be inflicted on those whose conduct and language, during their misfortune, should be covered with the veil of the deepest secrecy." * * *

It is true that this part of the regulations provides for the government of "attendants and assistants," but ought not the principle to apply to the officers as well?

Of course, they would be compelled, if required, to testify in courts; but nothing but a pressing necessity to justly defend themselves, or promote the public interest on questions directly in issue, would authorize a departure from the manifest propriety of this part of the regulations.

It is apparent to the committee that the production of this letter was not compulsory on the part of the superintendent, but that it was a willing and voluntary service. As especially applicable to him, the committee will close this part of their report by inserting here an extract from the last annual report of the superintendent, containing an elaborate lecture to the Legislature for repealing, in the law of 1865, the law of 1851–3, authorizing husbands and guardians to commit their wives and wards to the hospital without a jury trial, upon the opinion of the superintendent that they were insane. On page 39 the superintendent says:

"When it is reflected, by any thinking person, in how vast a majority of instances it must be that those sent here are sustaining the tender relations of brothers, sisters, sons, daughters,

parents, husbands and wives of those who, in the nature of the case, appear as *quasi* prosecutors—what antagonisms of the most painful and lasting kind are wantonly engendered—what violations of delicacy, and often of decency—what outrages upon mental and physical suffering—must be the result. While this enactment exists, it will be agreed that no terms of reprobation are too strong to be applied to it."

If such language can with any propriety be used to describe the "violation of delicacy, and often of decency," resulting from producing before a *jury* in open court the peculiarities and habits of the person alleged to be insane, what shamelessness, then, must there be in a disclosure for publication to the whole country of the peculiarities and habits of a person actually confined in a hospital for the insane, unless such disclosure is made absolutely necessary for the defense of individual rights, or the promotion of public justice.

Nor did the effort to destroy the testimony of this witness end here. Failing to discover satisfactory proof of insanity in her manner, or facts sworn to by her, it was undertaken to be shown that her views on certain religious and metaphysical subjects, as found in her book, could not be entertained by a sane person. Her book was produced, and three passages were referred to, to-wit:

On page 51 of her book, under the head of "transmigration of souls," she says: "I fully believe in this doctrine or truth, because it is a demonstrable fact, that souls do inhabit different bodies, at different periods of their existence, as really as vegetable and animal life exist in different forms or bodies."

In relation to this passage, she says, in her testimony, page 98 of the journal of the committee: "I believe we do; that life is one continued succession of existences; and we only enjoy a part of it in this life—as vegetable and animal life are perpetuated in different forms—the butterfly and the chrysalis is the same life, although in different forms. So, on the principle of analogy, I infer that the human life exists in different forms."

On page 52 of her book she says: "I have no more doubt but that Shakspeare and Washington, and I don't know how many more of earth's noblest thinkers, have dictated portions of my book, than I have that my own mind is used as their medium of thought. It would he impious in me to boast of having written

my book, unaided by the most *superior minds* of the universe. Its contents designate its heavenly origin."

In answer to the question as to whether she had any special aid from other minds in writing this book, she says, in relation to the last extract: "I regard God as the author of all truth. I don't make the truth; I only report it—am only the medium of it—simply tell it. In that sense I am God's medium. I believe the devil is the author of all falsehood or lies; and when I speak a lie, I am the devil's medium."

On page 66 of her book, she says: Mrs. Packard is the writing medium of this book. Dr. McFarland is her chosen scholastic critic. But God, alone, is the dictator of the contents of the book —my book—God's book—our book."

In her testimony—page 97—in answer to the question of whether she had any special aid from other minds in writing this book, she says: "I don't know that I had. I have read various books; and ideas which I received from this and other sources have quickened into thought, and I reduced them into form. I believe that mind communicates with mind, whether in the body or out of the body. I get ideas from the writings of Jesus Christ, although he is not in the body."

The committee express no opinion upon the soundness or orthodoxy of the opinions contained in these extracts from the book referred to, for they do not consider that question necessarily involved in their examination; yet the prompt and plausible manner in which her views were defended or explained, while on the stand, tended to increase the probability of her sanity, and afforded a striking instance of the danger of pronouncing a person insane simply because of their belief upon such subjects.

INSANE WITNESSES.

Insane persons are excluded as witnesses in courts, upon the ground of *deficient understanding*, and as witnesses are required to take upon themselves an oath to speak the truth; and as an oath is an outward pledge, given by the person taking it that his attestation or promise is made under an immediate sense of his responsibility to God; and the purpose of the law being to lay hold on the conscience of the witness by this religious solemnity; it follows, that persons *incapable of understanding* the nature and obligations of an oath ought not to be admitted as witnesses, be-

cause they would then testify without its obligations and sanctions, and their testimony, for the want of *understanding*, would be found more likely than otherwise to mislead courts and juries. And it makes no difference whether this *defect of understanding* be temporary and curable, or permanent—whether the party be hopelessly an idiot or maniac, or only occasionally insane—as a lunatic, while the deficiency of understanding exists, the person is not capable to be sworn as a witness. But if the cause be temporary, and a lucid interval should occur, or a cure be effected, the competency is restored. And this deficiency of understanding being once shown to exist, the presumption of law is, that it continues until the contrary is proven. Indeed, the presumption of law in relation to this subject has been, and is, that persons *deaf and dumb* from their birth, are idiots; and though this presumption has not now the same degree of force which was formerly given to it—that class of persons being found, by the light of modern science, to be much more intelligent in general, and susceptible of far higher culture, than once supposed—yet still the presumption is so far operative as to devolve the burden of proof on the party adducing the witnesses, to show that he is a person of sufficient understanding.

Having these principles in view, which are declared by the courts and writers upon evidence to be the law, the committee examined nine witnesses—who had been under treatment in the hospital, and who were discharged without the opinion of the superintendent that they were recovered, or without preliminary testimony of other witnesses, before they were sworn, that they had recovered. In fact the committee thought it not unlikely that, in this investigation, it might be proper for them to receive the statements of patients confessedly insane, in the hospital, touching their personal usage—not, however, on the supposition that what they might say would be, technically, evidence binding upon the officers of the hospital—but on the supposition that some light might be thrown on the probabilities of the question as to whether they were kindly treated or abused by the attendants and officers, and thus lead the committee to seek proper evidence elsewhere. In the personal inspection of the hospital, and the examination made by the committee and Drs. Johnson and Patterson, in July last, several general inquiries were made of patients, on this subject, but no answers thereto were entered as testimony, or considered strictly evidence in the case.

The nine witnesses thus examined, and whose testimony is submitted as evidence, are Mr. Searles, Mrs. Shedd, Mrs. Packard, Mrs. Commonford, Mrs. Oleson, Mr. Eastwood, Mrs. Menard, Isaac White, and Marshal B. Burr, and affidavit of Mr. Gurthie. The latter is not considered by committee. And although the committee confidently believe the conclusions at which they have arrived are clearly supported, without the evidence of either of them, (that of at least four of them was comparatively immaterial,) that, in point of intelligence, character and credibility, they are as worthy of belief as other witnesses, upon whose testimony in courts the property, character, liberty and lives of suitors daily depend. Without reference to a question which might be raised, as to whether, under the statute of 1851, married women, committed to the hospital without any sworn testimony or judicial investigation of the fact of their sanity or insanity, and on the mere unsworn opinion of the superintendent that they were insane, at the time of admission or discharge, is such a determination of the fact of insanity that there is a presumption of law as to its continuance; and without reference to their mental condition at the time of their discharge, the committee have entire confidence in the belief that all these witnesses had a clear understanding, and comprehended, when examined, the obligations of the oath administered to them, and in an unusually intelligent manner testified to matters within their recollection, and were prudent and entirely honest, and testified to facts as they believed them to exist. With one or two unimportant exceptions, neither of them exhibited any appearance of a disordered intellect, moral obliquity, or defective memory; and, therefore, to reject their testimony, appeared to the committee as calculated to defeat an investigation after the truth, and possibly subvert the ends of public justice. In this point of view, and for these reasons, their testimony has been accepted and reported as a part of the evidence.

In relation to the reliance to be placed upon testimony of witnesses who have once been insane, and who have partially or fully recovered, there have been twenty-two witnesses examined. In July last the trustees and superintendent proposed to the committee to join in a commission, to take the testimony of non-resident medical or professional experts who were, or had been, in charge of the insane in different states. The testimony proposed to be thus taken was upon a variety of subjects, in relation to the treat-

ment of the insane, suggested, no doubt, by the testimony of witnesses who had been examined by the committee. The proposition was declined by the committee, on the ground that they had no authority to join in such commission, but it was suggested that if the testimony of such witnesses should be fairly taken, and, when offered, appear to be relevant to any questions pending before the committee, that its admissibility might be favorably considered. The testimony of these witnesses, residing in various states, was therefore taken and admitted, and is reported as a part of the evidence. The sixth of these interrogatories addressed to them, is as follows:

"What is your opinion as to the credit due to the statements of insane patients partially recovered; and what to the statements of patients fully recovered?"

The substance of the answers appears to be, that the statements of insane persons are unreliable by reason of their insanity; that the statements of those partially recovered, especially when they speak of their own treatment, or of things which occurred during their insanity, are to be taken with "grains of allowance;" but the statements of those who are fully recovered may generally be believed, provided they are honest and their memory not defective. The testimony on this *part* appears to be very clear and very candid, and undoubtedly more learned and better reasons are assigned for their opinions than could be named by unprofessional persons. Their conclusions are so *very reasonable* that no person of ordinary observation can fail to agree with them, to the extent named, although it might be doubted whether the fact that a person who, after his discharge, complains of his treatment, should be considered almost a presumption that he had not fully recovered, as is substantially stated by some of these witnesses.

The answer of John Fonerden, medical superintendent of the Maryland Hospital for the Insane, fully expresses the view of the committee, and is as follows: "The credit due to the statements of insane patients, partially recovered, and of those fully recovered, must depend upon what appears to be the trustworthiness of each individual patient, from what is known of his disposition." In other words, if the patient is trustworthy, and is not "deficient in understanding," he may be relied upon as a witness, which is precisely the rule applied to all other witnesses, except that more care and discrimination are required with those once insane, but par-

tially or wholly recovered, to test the understanding and determine whether any delusions still remain in the mind to influence the judgment.

That the statements of insane persons, and those partially or fully recovered, are daily taken and acted upon by every person having the charge of the insane, is too plain to admit of doubt. Else how could they know their wants, or punish those who abuse them? Frequently only in this way. That they are oftentimes unreliable—that they often or occasionally complain of their treatment without good cause—that they sometimes are deceitful and cunning, and lie, and are ungrateful—at most proves that they are human; and that, by reason of their mental infirmity—their disordered intellect—their frail memory—they are less entitled to credit than sane persons. But to totally reject their statements as never worthy of credit, and especially in an investigation of this kind, would be to leave them not only defenseless, but a prey to every brutal lust and passion; would leave such wretches as some attendants, whose names appear so frequently in the testimony, to go unchallenged and unwhipped of justice—a result so deplorable as to undermine and break up every hospital and asylum for the insane in the country.

The evidence of these experts referred to, and the reasons assigned by them, are believed to be in harmony with, and not in opposition to, the action of the committee, at the time the witnesses, who were formerly supposed to be insane, were examined. Yet, that there may be no misunderstanding upon this, the committee would here repeat, that, in their judgment, the proof of the charges of abuse of patients does not depend upon the testimony of insane witnesses, or of those who have fully or partially recovered from insanity, but is abundantly established by other witnesses.

CONTRADICTION OF WITNESSES.

There is in this case, as in almost all others of importance, contradictory evidence; but the committee are of the opinion that it cannot with any fairness be pretended that the contradiction of some witnesses, as to particular facts sworn to by them against the management of the hospital, is sufficient to materially weaken, much less destroy, their testimony—especially as throughout the whole case there is a corroboration and agreement between them,

upon the main question of this branch of the inquiry, entirely inconsistent with a dishonest intention on their part, unless it be assumed there is a general conspiracy among them, of which there is not a particle of testimony.

A reference to a few of the more important instances of contradiction may illustrate this. Edmundson, who was an important witness, was assistant engineer from April, 1861, to October 2, 1862, and testifies to various instances of abuse. He swore that, about a week after he went there, he saw Tinker, an attendant, knock a patient down with a mop-stick, without any provocation; that he, the patient, seemed to be dead—not able to get up, and was soon taken to the screen-room; and that he, witness, proposed to Eastman, the engineer, to report the case to Dr. McFarland; that he and Eastman had conversation about the matter, and Eastman advised witness, if he wanted to retain his place, he had better not report Tinker; and that it was understood by him, witness, and others, that such reports were not favorably received, etc.; and therefore the witness did not report this and other cases of abuse which he witnessed, to the superintendent. To impeach Edmondson, and show the improbability of his having seen these abuses, because he did not report them, the deposition of Eastman is taken, who swears that he never told Edmundson, in substance, that if he wanted to keep his place he should keep his mouth shut, and that reports of misconduct and abuse would not be tolerated. *But Eastman does not deny, nor was he inquired of, whether Tinker did not knock the patient down, as testified to by Edmundson, nor if Edmundson did not complain to him of this brutality of Tinker, and threaten or talk or propose to report it to the doctor.* Eastman may or may not have remembered telling Edmundson; Edmundson may or may not have done wrong in failing to report, because he was afraid of losing his place if he did, but he is not to be disbelieved on the strength of this kind of contradiction, especially as he is corroborated by other witnesses in this, that neither by the by-laws or the understanding of others, were such reports required to be made by attendants or subordinate employees of the institution.

Again, Edmundson swears that upon one occasion George Richards, a patient who had been kept naked in the screen room in the cold winter, and who sometimes begged for warmth when witness went to get steam up at two or three o'clock in the morn-

ing, was in the hands of patients acting under the direction of the attendants; and they were about to plunge him into a tub of scalding hot water, when Richards was rescued by Cooper, another patient; that he saw this through an open window, and had frequently seen Richards in the screen room through the door, before he came out in the morning. To show that Edmundson, from where he said he stood, could not have known whether the water in the bath tub—which was supplied with a cold and hot water faucet—was scalding hot, Mr. Lord, the present engineer, was produced and swore that from the outside of the bath room to the inside of the bath tub was about six feet, and thought that a person standing on the outside of the window could not form an idea of the *temperature of the water in the bath tub by looking at it*—that it did not come in there boiling hot. Now, while Lord testifies what may be true, it by no means follows that Edmundson could not tell by the steam arising from the water as it was discharged from the faucet, whether it was hot or cold water; and Lord does not pretend that Edmundson could not have seen from which faucet the water was discharged. And to show that Richards could not have suffered from cold when in the screen room naked, in the winter, as sworn to by Edmundson, Mr. Lord was enquired of concerning the manner of heating the wards, and testified that it has been the custom to keep the house comfortable; sometimes necessary to keep steam on all night; and in cold weather, when the heat is kept on all the night, one engineer must be on duty all night; "that steam is usually kept on until nine, ten, eleven, or twelve o'clock." That it is the intention to keep the building comfortable, is no doubt true; but it must also be true that making allowances for a change of weather after steam is shut off, and occasional derangements of the heating apparatus which conveys the heat to the flues in the walls, it may be very well believed that a man naked in a screen room, at one, two, and three o'clock in the morning, might be cold, and appeal to the engineer, when he came on duty, for warmth; and that, too, without reflecting upon the engineer or general directions given by the superintendent for warming the buildings. Richards was kept in one of the "old wings," and the superintendent, in his last report to the Legislature, (page 35,) says: "With all the agreed perfection of our system of boilers, pipes, etc., the air in the old wings is with difficulty kept at proper temperature

in extreme cold weather, entirely from the bad construction of the flues in the brick walls."

Again, Merrick swears (page 134,) that "Creighton, a patient, was beaten and bruised badly, and died soon after, and that he helped lay him out; that his head and face were swollen very much; was black under the eyes, and on the cheek bones; that there were bruises about his arms and shoulders and other parts of his body, and had a cut or wound on his face." Dr. Dutton, the present senior assistant physician, is called to contradict or explain this, and says (page 277,) "that he remembers the case of Creighton; that he (Creighton) was under Dr. Emery, who is now dead; but that Creighton's remains were sent home, and no complaint was ever made by his friends about the condition of his remains!" But whether the poor man had any friends who examined his remains after they reached home, does not appear.

Miss Jennie Kee, (page 118,) Mrs. Cassell, (page 177,) and Mrs. Graff, (page 295,) whose testimony will be more fully referred to hereafter, mention the case of Mrs. Farenside, who, on one occasion, had a black eye, and when inquired of as to the cause, said when the Doctor was bringing her down stairs she resisted, and he struck her. The circumstances connected with this matter are mentioned by these witnesses. To disprove this statement of Mrs. Farenside, or show the improbability that the Doctor struck her, instead of some one else, her husband testified that she never told him that the Doctor struck her, but admits that she complained to him of the institution. It seems, from the testimony of her husband, that Mrs. Farenside was sent by him to the hospital in 1860, discharged July 29, 1862, and readmitted in January, 1865, and remains there now; that her insanity was paroxysmal; that the first cause of it was a supposed joy at her husband's sudden return home after an absence of a week, during which time she supposed him dead; that her malady is supposed to be incurable; that while she was home, and prior to her second admission, he had heard that she had been badly treated, and inquired about it; that when she appeared sane she made no complaints, but when she was not sane, grumbled about the institution and him; that he is poor and pays nothing for her board, although she is not in the hospital as a pauper. The conduct of this patient was different when the committee saw her than described by her husband; for, having had their attention spe-

cially called to this case, and finding her in the hospital, the committee and Drs. Patterson and Johnson made special inquiry of her concerning her usage, and inquired of her if she had ever been struck by any one in the hospital. Though she was believed to be insane at times, she evidently understood the inquiry, and her reply was, "she did not want to talk about the matter"—neither admitting nor denying, but apparently acting under restraint. Under the circumstances, the committee, therefore, do not consider that the negative testimony of her husband disproves the testimony of Miss Kee, Mrs. Cassell and Mrs. Graff; for, although they neither of them swear that they saw the Doctor strike the patient, the fact proven that she was injured by some one, and at the same time said the Doctor struck her, together with the circumstances detailed by three different witnesses, leaves little doubt that her statement was true.

Another case of contradiction upon a single point is between Miss Kane and Mrs. Hasckett, in relation to an indignity which Mrs. Hasckett, an attendant, committed upon a Miss Magin, a patient. Miss Kane, among other matters, distinctly swears to it; (page 130,) and Mrs. Hasckett, (page 313,) says that she knew a patient by the name of *Dwyre;* that she does not remember the case testified to by Miss Kane, and that she never committed any indecency upon any female patient. The committee presume Mrs. Hasckett has forgotten the matter, and believe Miss Kane.

THE SUPERINTENDENT.

The committee would not for a moment conceal, or seek to conceal the fact, that—in approaching the consideration of the question as to the responsibility which properly belongs to the superintendent in the government of the hospital, how far he can justly be held responsible for the conduct of his subordinates, and what is the position he now occupies to the people of the state, in the light reflected upon him by the evidence submitted—they do so not without embarrassment, but with some appreciation of the numerous and varied difficulties and embarrassments surrounding the office, and a most sincere and painful consciousness that, though their duty seems plain, the result of this examination, nevertheless, must disappoint his numerous friends and admirers throughout the state. Yet, no one can attentively read the very intelligent and learned testimony of the medical witnesses exam-

ined, including several superintendents of similar institutions—some of whom have a high national reputation—without feeling the necessity of carefully considering all the difficulties of the position, as well as the rigid rule of accountability which ought justly to be applied to an officer occupying that responsible position.

Some of these principal difficulties grow out of radical changes, in the treatment and government of the insane, from the old system. Dr. Isaac Ray, of Philadelphia, who has been in charge of the insane for twenty years, so concisely defines these changes, and the objects of them, that the following extract is made from his testimony. He says:

"Up to the early part of the present century, the insane were restrained, in hospitals, by chains, iron collars, and straight jackets; by fastening them to their beds or strong chairs, and seclusion in their rooms. At present, and for many years past, restraint is effected solely by the *camisole*, which is a simple linen or cotton jacket laced or buttoned behind, with long sleeves crossing in front and tied together behind; by *wristers*, which are leather bracelets put upon the wrists, with a strap passing through them in front and buckled behind, whereby the hands are prevented from striking, while they are allowed a considerable degree of motion; by a leather *muff*, in which the hands are confined; and by seclusion, or solitary confinement. In some hospitals a contrivance is used for confining a patient to his bed, called the bed-strap, introduced by the late Dr. Wyman, Superintendent of the McLean Asylum, in Somerville, Mass. The principle which has governed all the changes, is to effect restraint in the easiest possible manner and in the least possible degree, consistent with the welfare of the patient and the safety of those associated with him. And in this connection it should be considered, that, whereas restraint was formerly applied for long periods and as a final measure, it is now, for the most part, of short duration, and intended to meet an emergency until other measures shall have had their effect. Especially is this so with respect to seclusion."

"In every well-regulated hospital for the insane, patients are associated together in the different wards according to certain rules of classification, *the object being to place those together who are least likely to offend or disturb one another. A quiet patient is placed with other quiet patients, and a noisy, excited, or violent*

patient with those of similar traits. A refined, cultivated person is placed where he will not be annoyed by the vulgar and profane."

These remarks of Dr. Ray cover the whole case as to change from old to present system—the "restraints" or mechanical means of confining patients now used, and his opinion of the proper classification of patients. Of course the change from isolation or solitary confinement, to association and classification into wards, as it increases the personal liberty of the patient, the risk of collisions among themselves and with their attendants, is increased. But these risks and injuries from collisions are supposed to be more than counterbalanced by the benefits which the patient receives from his liberty and association; and the testimony would appear to clearly establish the superiority of the present over the former treatment. It is not with the relative merits of these opposing systems, however, that the committee have had to deal, but to endeavor to ascertain whether the injuries inflicted upon patients have been *incidental to their government under an approved system*, or otherwise. Of course occasional collisions will occur among patients when thus associated together, and that, too, without the fault of the employees. So far as the abuse of patients *by attendants* is concerned, the opinion has already been expressed that such abuses were in violation of the well understood printed regulations; and being without any conceivable motive, they must be the result of a want of discipline over the attendants, and that care and watchfulness, on the part of the officers, so indispensably necessary in such an institution.

And the committee had well hoped that, although there might be mistakes or even neglect on the part of the superintendent, nothing involving his character as a humane man and gentleman would be shown to exist. In this, however, the committee have been grievously disappointed; and that there may be no doubt, after a careful inspection of the hospital and a large accumulation of evidence, to what extent the committee regard his administration, in respect to its *financial affairs* and *government*, a success or failure, they will undertake to briefly specify.

Dr. McFarland entered upon the discharge of his duties as superintendent, June 16, 1854; and, having served acceptably ten years, he was re-appointed, by the unanimous vote of the trustees, in June, 1864. In their report of December, 1864, the trustees mention him as possessing eminent qualifications—exhibiting

executive ability and fidelity in the discharge of his duties, that met with their unqualified commendation. To a man of philanthropic feeling or professional ambition, his position was then one of great usefulness, and almost an enviable one. Having had an experience of twenty years (ten years in New Hampshire,) in the treatment of the insane, he had seen the institution of which he was the chief executive officer, survive the troubles of earlier years and occupy a commanding position throughout the country. That he is a man of decided ability, of extensive culture, and so far as the finances of the institution are concerned, has been faithful in the discharge of his trusts, the committee have no doubt. In the purchase of supplies, which is done by private contract, under his direction—in the system of keeping accounts and vouchers adopted, in the rigid economy which seems to be practiced, and in the general superintendence of the fiscal affairs of the hospital, there does not appear any cause of complaint. *But it is in the government of the patients and attendants, and in the principle of classification of patients, that the difficulty is to be found.* Familiarity with suffering and sorrow has apparently, to some extent, deadened his sensibilities and sympathies; and, long accustomed to govern, he has become about the hospital (perhaps necessarily so) a kind of supreme law, and the rule of force has too often usurped the law of love.

The classification of patients in their wards does seem, in many cases, fundamentally wrong. The most desperate and vicious occupy the lower, or what is called the "worst" wards; yet, in many cases, the noisy and turbulent, the profane and vulgar, are associated with those of apparently opposite character and habits; and it is in proof, that transfers are made from the best to worst wards, as punishment for offenses, although, in theory, the words *punishment* and *offense* are banished from the vocabulary of hospitals for the insane. In reply to inquiries for the reasons of this classification, the superintendent informed the committee that patients of opposite character and tendencies were frequently benefited by such association—that the violent and noisy would be sometimes restrained by the quiet and orderly, and at the same time the sedative and melancholy would be profitably aroused by the boisterous, and thus both classes, by counteracting influences, be benefited. Experience, no doubt, is usually a safe guide, and though the committee frankly admit they have had none, in

this respect, yet, remembering what they saw in the hospital, they would respectfully and firmly protest that such association does not appear reasonable in itself; and they do not think the practice is fully sustaind bythe testimony of superintendents of other hospitals. Dr. Ray, it will be noticed, says "a quiet patient should be placed with other quiet patients, and noisy, excited, or violent patients with those of similar traits; a refined and cultivated person should be placed where he will not be annoyed by the vulgar and profane." Dr. J. W. Sawyer, Superintendent of the Butler hospital for the insane, at Providence, R. I., says, that "*patients should be associated whose cases are similar.*" Dr. W. P. Jones, Superintendent of the Tennessee hospital for the insane, says, that "*to permit the unrestrained association of homicidal patients with others, would indeed be most culpable and cruel conduct on the part of any superintendent.*"

The committee remember, in this connection, a homicidal patient from Lake county, who, not long since, under a real or pretended delusion, killed his wife, and was sent to the hospital instead of the gallows. He was in a ward of apparently peaceably inclined patients, who *may* not be disturbed by him unless he should some time have a "call" to kill them, in which case there is no doubt he would do it, for he is physically a powerful man. True, he had manifested no homicidal tendency while in the hospital, but the fact that he had killed his wife suggested the grave responsibility of leaving other lives exposed.

This question of classification of patients is the only one, which may be regarded as professional, upon which the committee have intimated an opinion, and they have done so in this instance only because they supposed it was one upon which, in some respect, all persons might safely entertain an opinion.

As to "restraints," it appears that those in use in the hospital, to-wit: the screen-room, the camisole (or straight-jacket), the wristers, the bed-strap, and crib-bedsteads, whose uses are explained in the testimony, are such only as are used in other hospitals; and instead of being, when properly used, instruments of torture, they seem a very proper and necessary means of controlling patients in their paroxysms, or when they manifest suicidal or homicidal tendencies. The shower-bath, in this hospital, as in others, and generally in the prisons of the country, has gone down, under the enlightened and humanizing spirit of the age.

The ordinary] bath-tub is properly retained, because it constitutes a part of the curative treatment of the insane. It has also been used in this hospital by the attendants, as a means of punishment, and it is evident that the threat of a bath had more terrors to Miss Eames (p. 121), and Maggie Rowland (p.122), and Mrs. Clark (p. 125), or any disobedient patient, than a straight-jacket. The straight-jacket, useful in itself, was found too harsh, and in 1860, was changed, at the suggestion of Miss Dix. It was also sometimes secretly used by attendants as a means of punishment, although it cannot be that the superintendent ordered its use or knew of the scenes described by Mrs. Graff (p. 12), or the cases of Mrs. Boyce and Miss Jane Berrickman. *It does, however, appear in the evidence that about forty patients, whose names are given, and about twenty, whose names are not remembered, have been abused by attendants; and about twenty-five attendants, whose names are given, have been guilty of these abuses.* It also appears that several attendants have been discharged, for neglect and cruelty; but how many, or whom, or for what particular act, and under what circumstances, does not appear, except in three cases, where they were discharged and fined by a justice of the peace. It does not appear, either, that any of the attendants above referred to were discharged for such cause, but it is shown that one or two of the attendants first above enumerated are now in the service of the institution.

As a general proposition, the superintendent is responsible to the public for the conduct of his attendants. He may or not be censurable on account of their abuse. This depends upon the frequency and extent of it. Though printed regulations and oral instructions forbid it—though, as in this case, several of the witnesses who testify to it, voluntarily protest that they did not believe the Doctor approved or in many cases knew it—though it is likely that many instances came to his knowledge, for the first time, in the evidence; yet if he failed to adopt vigilant means to prevent or detect or punish it, when known, then is he responsible for it. In one respect, his police regulations are bad, and fatal in his government. He assumes that insane patients are never to be believed, and therefore does not listen with favor to their complaints. He substantially denies the right of petition and investigation; and like all public officers who do this, he finds himself, too late, surrounded by difficulties, and imposed upon.

He does not require or encourage attendants to report to him each other's delinquencies, but depends upon his supervisors, and assistant physicians, to report all violations of the regulations. And right here is believed to be the explanation of his ignorance of a large portion of the abuses. His government of patients is believed too severe, and his discipline of attendants too mild, and it is doubted whether an increase of wages, in order to secure a better class of attendants, would remedy the evil, so long as the present policy in this respect remains unchanged.

Nor does the responsibility of the superintendent for this state of things terminate here. We sincerely wish it did, and are reluctantly compelled to refer to some portions of testimony in relation to positive acts of his—not so conclusive upon one point, it is true; but it is difficult to resist the force of it. Touching his further neglect, as well as personal abuse of patients, the following appears in the evidence:

Miss Kane testifies (p. 5) that when she went there, the Doctor told her, that "she would hear a great many hard stories about the institution, but she must not believe a word of them;" that at one time (p. 9) eleven were sick in her ward with flux, four of whom died, and were not furnished with medicines, nor she with any extra assistance to nurse them; a neglect, if true, (and it was not contradicted,) that amounts to a positive wrongful act, and should be so esteemed by right thinking men.

Mr. Searles, after describing his horrible suffering from his sickness and disease—his confinement (perhaps necessary) in a straight-jacket—testifies, "that he does not know as Dr. McFarland was cognizant of the operation, for at that stage of his treatment he never went to him for sympathy or a redress of his wrongs, knowing, as he did, too well, the nature of the man; and that even if had he been disposed to do so, he had little opportunity, for *he seldom made his appearance in the ward.*

Captain Henry testifies (pp. 55 and 56) that he on one occasion rescued a patient, who was being tortured by two patients holding him on his back, and a third pouring water in his face from a pail, when he rushed in and drove the wretches from the room, and reported the case to the Doctor, who paid no attention to it; and the witness then reported the case to the president of the board of trustees, and threatened that if such abuses were repeated he would go before the grand jury.

Mrs. Shedd testifies (p. 68) to what she considered as improper liberties with her. As to this transaction, the committee are not well satisfied whether or not Dr. McFarland's conduct was intended as mere playfulness, or whether Mrs. Shedd is correct in her understanding of the matter.

Mrs. Bland testifies (p. 125) that she reported one case of abuse, when the Doctor told her to "mind her own business," and that on that account she did not afterwards report other cases which she described. Merrick testifies (p. 138) that, when he was first employed, the Doctor told him to *keep his mouth shut and his eyes open*, and he did so, until Mr. Supervisor Doane hurt Myers, when Merrick told Doane if he hurt another man he would report him. Edmundson (p. 168) says, that when he went to the Doctor about his business, he generally got a very short answer, and he came to the conclusion there was no satisfaction in going with complaints to him.

Mrs. Cassell says, (p. 184) and Miss Kane, that it was the practice of the house not to allow persons in feeble health, sickly and weak, to lie down in the daytime, and that she had frequently heard complaints from such persons on that account.

Miss Oleson testifies (p. 207) that she informed the Doctor of these abuses once, that she well recollects of, and the Doctor promised an investigation.

Miss Jennie Kee says (p. 118) that Mrs. Farenside was, on one occasion, brought from the 7th ward, and placed in a room in the new wing; that she was afterwards brought to her ward; that while she was in the room in the wing, witness and Elizabeth Bonah went to look in to see her, when Dr. McFarland told Elizabeth that he did not want her to open the door of that room, unless he gave particular orders; that when Mrs. Farenside came to her ward, she had a very black eye, which she (Mrs. F.) said was done by Dr. McFarland's hand; that Mrs. F. said she resisted the Dr. when he was bringing her down stairs, and he struck her; that Mrs. F. was in this room alone by herself three days.

Mrs. Cassell says (p. 177) that this case of Mrs. Farenside was talked a great deal about; that she appeared one morning at the breakfast table in the 5th ward, after having been removed from the 7th ward—which was from the best to the worst ward—with a black eye; that witness inquired of her the cause, and Mrs. Farenside told her the Doctor struck her; that her face was very

much bruised and blacked for several days. Witness also says that Mrs. Farenside was a quiet patient, and that if she had been a violent or boisterous patient she would not have been in the 7th ward, where she was until after this occurrence, when she was transferred to the worst ward.

Mrs. Graff also refers (p. 295) to the case of Mrs. Farenside, and says that on one occasion, during the latter part of her stay there, she saw Mrs. F. sitting in her ward, and the Doctor told her not to go near her, for he was "cooling her off."

Mrs Packard testifies (p. 100) that, one Sabbath as she was going down stairs, the Doctor met her, and seizing her violently by the arm, told her to return to her ward; and she not obeying, but standing still, the Doctor attempted to drag her back, but seeing Drs. Sturtevant and Tenney, he suddenly let go his hold, and she fell from his grasp down the stairs upon the hall floor below, and was almost stunned, and that the Doctor went along without helping her in the least. Mrs. Packard also testifies (p. 106) that, on another occasion, she saw the Doctor lead a very sensible and industrious patient from one ward to another, while he was in a great rage from a verbal reproof the patient had given him; that he took her down the back dark staircase, himself following behind, and kicking her back as she was passing down, when thus hid from all observers; and that the patient could show black and blue spots upon her back for weeks afterwards, which the patient said were caused by the Doctor's kicks.

Mrs. Cassel further testifies (p. 188) to Mrs. Farenside's complaining that the Doctor had kicked her; and as the name of the patient to whom Mrs. Packard refers as being kicked, is not mentioned, it may be that both refer to the case of Mrs. Farenside. If not, then they are, of course different cases; but, from the statements of the patients, the punishment was inflicted by the Doctor himself, and it is immaterial whether these witnesses refer to the same or different cases.

In relation to this case of Mrs. Farenside, the testimony of her husband has been referred to on the question of contradiction, and need not be repeated. It is true that no one swears to seeing the Doctor injure Mrs. Farenside. They describe the injuries to her, and some of the circumstances occurring before and after the injuries, and also, that immediately after it she said it was committed by the Doctor; and as there can be no doubt there was

difficulty between them at the time, the testimony of the witnesses amounts to a corroboration at least, and the testimony being unexplained, the conclusion seems almost irresistible that Mrs. F. told the truth about it.

There appears in the evidence but one more case of punishment inflicted by the superintendent, or under his immediate direction, and that seems, from unquestionable proof, full of dramatic interest. Mrs. Graff (p. 13) says that in the spring before she left the institution (spring of 1861), the Doctor inflicted a terrible punishment upon a one-armed patient, who had been sent to the hospital after a trial for murder; that the punishment was for striking an attendant, Bell; that the attendant was struck in the morning, and as the witness was going at night down for water she met the engineer and porter of the hospital going up with chains and buckets of water; that soon after she heard (p. 294) the voice of the patient, away up in the upper part of the wing, in the further corner, crying "Oh, Doctor! Oh, Doctor! Oh, Doctor!" She says she knows he was chained and punished with a shower bath, because she saw the engineer going up with chains, and that he, the patient, afterwards had the chains upon him while she remained there; and though she did not follow the porter and others, who had pails of water when they went up, she is well satisfied he was put in a shower bath; and she knows the Doctor directed it, because she went to the Doctor that night and asked him to pay her and let her go, and that he told her, perhaps she did not understand the case (p. 13), that "he had saved that man from the gallows," and (p. 294) that "he witnessed the punishment himself." In relation to shower baths, Mrs. Graff says (p. 295) that she never saw a shower bath used, but she knows they were used, as well as she could know without seeing them; that when she first went there—in July, 1858—there was a shower bath in every ward, but they were taken down when Miss Dix came there, which she thinks was the second year after she came there. If she is correct in this, the shower baths were taken out of the wards in 1860, and before the spring of 1861, when she says this punishment was inflicted.

But that this one-armed man, whose name she does not remember, but who is undoubtedly the patient named as Wyant in the testimony of Dr. Bell (p. 404), was dreadfully punished for striking the attendant, Bell, and that the water and chains were applied to

him there cannot be a doubt. The whole circumstances of the case appear revolting. It may be that the patient was a violent desperado, yet the justification interposed, that he might be thus punished because his life had been saved by the Doctor's testimony, is almost too shocking to be believed, and shows that the will which directed the punishment must belong to a "man of iron," and the mind which could entertain such claims of gratitude must be "fatally bent on mischief."

The only remaining class of testimony, which will be referred to, is that in relation to the testimony of Miss Julia A. Wilson, who testifies to an insult offered to her by the superintendent in July last. The circumstances connected with taking this evidence have already been alluded to, and will more fully be seen by reference to the journal of the committee, and the testimony of Miss Wilson, and J. D. H. Chamberlin, Esq.

It appears, from the testimony of this witness, that she is thirty-two years of age, was born in Buffalo, N. Y., and has resided there the principal part of the time since. That she is the daughter of a widow lady now residing at 375 Michigan street, Buffalo, her father having, for several years, been connected with the Buffalo Commercial Advertiser, and who died about eighteen years ago—leaving her mother and a large family with no property except their home; that in the latter part of July last she had a sister, a Mrs. E. D. Brown, in the hospital, who had been a patient there since 1861, and whom she had previously visited, and concerning whom she had corresponded with the superintendent; that in visiting her sister at the hospital, she had made the acquaintance of a Mrs. Dr. Grant, of Jacksonville, with whom she had also visited; that a short time before a certain Thursday (July 26th) in the latter part of that month, she had received a letter at Springfield (where she was at work as a seamstress in the family of R. E. Goodell, Esq.), from the Doctor, concerning the discharge of her sister; and that on that Thursday afternoon she went to the hospital to make some clothes for her sister and prepare her for removal; that she saw Dr. McFarland at this time, and he told her that there was no room there then, as they were full of guests, but that they would be away the following Friday noon, and he invited her to come and stay at the hospital; that she told the Doctor that as she had some purchases to make, she would return there on Saturday; that on Saturday she went back to the hos-

pital about five o'clock—saw the Doctor in the reception room, when he immediately showed her up to the room she was to occupy, and talked to her about the condition of her sister; that in this interview the Doctor said she had better not anticipate removing her sister then, as she was not fit to live among sane people, but told her to remain a while, and they would try and make it comfortable for her, and she could then see for herself; that on receiving this statement concerning the condition of her sister, and relying upon it, she was affected to tears; that she then told the Doctor that she wanted to see her sister immediately; that something was then said by her about her sister staying with her in that room, and the Doctor examined the windows and said they were not safe; that this alarmed her, and she decided not to have her sister remain with her over night; that she thinks the Doctor went out before her sister was brought in by an attendant, and returned; that on her sister being ushered in by an attendant the Doctor went out, but in a few moments returned and took a seat, and after talking a few moments he handed her an envelope and went out, and said he would return again, saying as he did so, that "*he wished her to examine that—that the key of Mrs. Brown's ward was there,*" but as she supposed it contained some directions about her sister's room or treatment, she did not open the envelope for some time, but sat and talked with her sister; that in this interview with her sister, she wept so bitterly that she annoyed her, and she asked witness what was the matter, when she told her sister that the Doctor had convinced her of the impracticability of taking her away then; that she then took her sister to the door of her ward and gave her to an attendant, and returned to her room and opened the envelope, which *contained an infamous proposal*; that as soon as she read it she was so angry she tore it in pieces and threw it on the floor, but she remembers the contents, and the following is the tenor of the note: "An appreciative friend, who deeply sympathizes with you in your trouble, wishes to know if his company will be agreeable after retiring hours;" that immediately on reading the note she was determined to take her sister away, and to stay with her until she could do so; that she is not positive, but thinks that the note was signed "A. M. F."

That she wrote an answer—as "she felt that she could not look at him"—the substance of which answer is attached to her depo-

sition, and is an indignant reply, accusing him of cruelty, informing him that he had misjudged her, but that she would let it pass—and saying that if she was compelled to remain on account of her sister, she demanded employment or a situation while she remained; that she cannot remember just how everything took place on this occasion, as she was weeping and excited, but says that when the Doctor returned after she had torn up the note he noticed the pieces and said, "what is this"; that she told him "that it was that infamous note"; that she asked him what there was in her appearance that induced him to so offend her, and he said "oh, nothing, I merely took it at a venture"; that he picked up a part of them and soon after left the room; that she then felt it would be safer for her sister to be with her, as she did not want to be alone, and went to the ward for her sister, but, finding her sleeping soundly, she returned to her room, locked the door, and stayed there alone; that in the morning her sister was brought to her room, and remained with her while she was at the hospital.

That Monday morning she went down to Mrs. Grant's, and also visited Mrs. Grant almost daily for a week, about which time, or in the first week in August, she left for Buffalo with her sister; that during the week she had conversation with Mrs. Grant in relation to the insult offered her by the Doctor, and that she went purposely to see Mrs. Grant upon the subject; that she and her sister came directly to Buffalo, after leaving the hospital, and that, since her return to Buffalo, her sister has so improved that she is about the house—assists about the house in work, and has never, during the time she was staying with her at the hospital or since, manifested a disposition to injure herself or others, or been violent in her manner or language.

The chairman of the committee, in order to learn as much of the history of this witness as might appear necessary to an understanding of her character, inquired at considerable length of her family history—where she had worked and her means of support, and the circumstances of her coming to Illinois. Her answers to all these questions seem candid and reasonable, and appear in her testimony.

The witness was subjected to a rigid and lengthy cross-examination; and even a professional reader, it is believed, will be unable to find in the testimony itself any contradictions or improbabilities. She was called upon to write out and have attached

to her deposition copies of the note she received from the Doctor, and her answer. This she did; and in her cross-examination she states, that although she remembers his note very distinctly, she only remembers the substance of her answer—but she does remember that the moment she read his note she resolved to remove her sister as soon as possible, and to stay with her until she could do so; and on that account, and fearing that the Doctor might attempt to thwart her purposes, her answer was more tame than it would otherwise have been.

It cannot escape the notice of any one who reads the testimony of this witness that she swears that on the next day after the insult was offered her, she wrote to her brother-in-law in Chicago, concerning it, and also informed Mrs. Dr. Grant of Jacksonville, and others, of the matter, and advised with them concerning her duty. They invited her to stay with them until her sister was ready to leave, but as she feared, if she left the hospital before her sister was ready, the Doctor might thwart her purposes to remove her, and as her sister was staying in the same room with her, the witness had no fear of being again insulted by him, and adhered to her purpose of staying with her sister until she could get her away. *And on this account* she did remain nearly a week, and as a reward for her persistent determination she succeeded in seeing her sister safely reach home and enjoy comparative health and happiness.

Another noticeable fact is, that none of the several respectable persons residing in this State, whose names and residence are given, and who are acquainted with this witness, have been produced by Dr. McFarland, to even suggest a doubt against her character. In the absence, therefore, of any thing contradictory or suspicious in her testimony—in the absence of any contradictory evidence in relation to any conversations of her with other persons on the subject—in the absence of any conceivable motive on her part to manufacture this evidence, and in the absence of language likely *to be selected by her in the note itself*, the conviction is irresistible that her testimony is true. The testimony shows that the character of this witness is irreproachable at home, and she has challenged investigation of it here. She was not a willing witness, for after she had succeeded in getting her sister home she declined to write to her friends here on the subject, and it was not until the committee required her testimony, that she consented to make her affidavit.

Against this overwhelming testimony the moral character of Dr. McFarland is interposed. Several gentlemen in New Hampshire and Jacksonville have testified that he has the reputation of being a man of good moral character. This testimony the committee fully believe, but in the opinion of the committee testimony of character cannot prevail against such unquestionable proof of facts; and however painful and humiliating it may be to us, as citizens, to believe a man who occupies such a position should be guilty of such grave improprieties, it is nevertheless our plain duty to express the opinion of his guilt which the evidence clearly shows.

CONCLUSION.

In transmitting all the evidence, schedules and exhibits, in the possession of the committee, and without volunteering any advice to your Excellency, touching the propriety of the publication of the evidence, they would suggest that there might be serious objections on the part of their friends to the publication of the names of patients in the hospital. It may be a false pride or delicacy which many people have on this subject, yet it is well known to those most acquainted with the families of insane persons, that there is a strong inclination to withhold or conceal the fact of the mental infirmity of their relatives.

In view of this fact, the committee have prepared a special record, which contains the names of all patients in the hospital on the 24th day of July last, and the testimony of certain medical witnesses in relation to the condition of such as were the subjects of special investigation. Exhibits A, B, C, D, E, F, and G, contain the names of patients and employees in the hospital at different periods, lists of admissions and discharges at different times, and other matters relating thereto, which are not necessary to a full understanding of the evidence, as such portions of these exhibits, as appeared necessary for that purpose, have been incorporated in the evidence. Statistical information on different subjects connected with the investigation, has been arranged in schedules, and inserted in the journal as a part of the evidence. A publication of the investigation could, if desired, be made without the exhibits or special record referred to.

The committee has intended to give the most ample opportunity for explanation and defense against complaints and charges

made against the management of the hospital. That no injustice should be done to the institution or its officers, for the want of any proper information or evidence, the sessions of the committee have been multiplied, and a report postponed from time to time to accommodate the trustees and superintendents.

In July last an application was made to allow the superintendent to be sworn as a witness, and at their meeting in Bloomington, on the 12th ultimo, the committee refused the application, because the most, if not all, of the testimony against him was, if false, susceptible of explanation or denial, without his testimony, by other witnesses, many of whose names had been pointed out; and because to allow him to be sworn, and especially under such circumstances, in his own behalf, would be in violation of a well established practice in such cases. In the opinion of the committee, the late law, allowing parties in civil cases to be sworn as witnesses, afforded no good reason for a departure from the uniform practice of investigating committees.

The testimony was finally closed on the 30th ultimo, and after hearing the argument of the counsel, and carefully reviewing and considering the evidence, the committee unanimously resolved that it seemed their imperative duty to recommend an immediate change in the office of superintendent, and the correction of abuses shown to exist. A copy of the communication, addressed by the committee to the trustees on this subject, will be found in the journal of the committee. By reference to it, it will be noticed that the committee express the opinion, that the present attendants, and others now having charge of the attendants, (with one or two exceptions) appear to be well adapted to the service; and that, as the most of them are shown from the records to have been but recently employed, there is no reason to believe they have been connected with the abuses of patients, which it is the object of this investigation to correct. And in this connection, the committee take pleasure in tendering their grateful acknowledgments to all the officers and employees, for courtesies extended to its members, individually, while there in July.

The committee, throughout the investigation, has endeavored to jealously guard the true interests of the institution—to neither shield the guilty nor magnify their faults—but to carefully ascertain, as far as possible, the truth, and when ascertained, to fearlessly declare it. They have believed, and still believe, that in view of a late

ublic distrust in its management, justice to all persons officially onnected with it, as well as the patients, demanded a thorough nvestigation, to the end that if complaints so commonly made vere without foundation, the officers might be vindicated, and, if rue, they might be dismissed; and the committee do not at all ympathize with the feelings, very naturally entertained, by many ersons residing in the vicinity of our state institutions, that they who listen to complaints or promptly investigate them, are ene. nies to the institution. Such are its true friends.

A fair and impartial investigation never injures the innocent, but is frequently the means of their vindication, and a restoration of public confidence where that confidence has been causelessly impaired. Public confidence is the very life of this institution. Without it the hospital must be abandoned for want of support, and the hundreds and thousands of the poor and unfortunate insane of our state denied its benefits, and turned out, many of them, to languish in jails, and alms-houses, and private families, without hope, on their onward march to welcome graves.

The committee have also believed, and still believe, that this institution, notwithstanding certain irregularities and abuses disclosed in the evidence, has been of untold blessings to the state. Neither the interest or ambition of any man or class of men should be allowed to stand in the way of its continued prosperity and usefulness. Honorable watchfulness, and the fostering care of the executive and legislative departments of the state, are indispensably necessary to its success. The million of dollars already expended upon it will never be regretted, so long as it discharges its appropriate functions, and alleviates, instead of increasing, human woes.

In relation to the "other" institutions mentioned in the appointment of the committee, no complaints against their management have reached the committee, but as the resolutions require an examination into their "financial and general management," such examination has been carefully made, and a supplementary report in respect to them will be submitted to your excellency within a few days.

Before concluding this report upon the Hospital for the Insane, the committee would call your Excellency's attention to some facts connected with the future provision for the insane of the state. The principal object in view, in the establishment of this

institution, was to provide a hospital for the treatment of *curable cases*, and not an asylum for *incurables*. It would probably have been better if this object had been rigidly carried out, and no additions made to the buildings when its capacity reached 250, as originally contemplated; for it has been seriously questioned, by those having great experience, whether the care of about that number is not as great a tax upon the mental and physical capacities as one man is capable of sustaining; and beside, had this course been pursued, it is probable that before this time a separate asylum for incurables would have been erected, and thus have avoided combining two institutions in one; for the hospital has practically been more an asylum than a hospital. More than one-half who have ever been admitted, have been discharged as incurable, and from three-fifths to one-half now there are of that class.

There can be no doubt that this state is much behind many of her sister states in its provision for the insane, although it is impossible to ascertain precisely the number of insane in the state. The superintendent of the federal census, taken in 1860, says the greatest difficulty in ascertaining the number of insane in the country, is a "sensitiveness to public exposure which widely exists among persons who look upon mental alienation in a false light," and therefore, they often conceal a knowledge of it from the census taker. The best proof of this difficulty may be found in the fact, that according to that census, Illinois is reported as having but 683 insane, when the records of the hospital show that prior to that time about half that number have actually been discharged from the hospital as incurable.

The present estimate, made by those who have given the most attention to these statistics is, that in the United States about one to every nine hundred inhabitants is insane. If this estimate is correct, and Illinois has the same proportion of insane as other states, it will be seen that out of our population in 1860 of 1,711,951, there were in this state about 1,900 insane persons; and in 1865, out of a population of 2,141,510 there were 2,369; and allowing the same increase in population from 1865 to 1867 as there was between 1860 and 1865, our population is now 2,313,332, and of that number 2,570 are insane. Of these, there were 336 in hospital in July, leaving 2,234 outside of the hospital,

two-thirds of which latter number are supposed to be fit subjects for treatment and care in a hospital or asylum.

After making allowance for over-estimates on this subject, and deducting 500 who will soon be in the hospital, there will probably be at least 1,500 who will be unprovided for. Their condition is truly deplorable. They are either confined in jails and alms-houses, or chained in untenantable and unfit places, or wander about the country exposing the lives and property of citizens, and presenting in their persons objects of supreme pity.

What shall be done for them by the state, is a question which demands most serious consideration. Our pride at what we have already done will be somewhat lessened when we compare figures with some other states. Massachusetts has five institutions, with a capacity for accommodation of 1,850; Pennsylvania five, capacity 1,550; New York five, capacity 2,545; Ohio four, capacity 1,230; Kentucky two, capacity 750; Virginia (including West Virginia) three, capacity 900; Connecticut two, capacity 700. All of these are incorporations, but some of them not under state control.

That additional provisions for the insane of our state must soon be made, seems to be beyond doubt; and that in making such provision, regard should be had to the separation of curable from incurable cases, seems probable.

As the committee has no desire on this subject, except than to call attention to the subject in connection with the pressing wants which are found in almost every county in the state, it parts with the subject of the insane of the state with the anxious wish and confident hope that our noble state will "generously provide for her own."

ALLEN C. FULLER,
ANDREW J. HUNTER,
ELMER BALDWIN,
T. B. WAKEMAN,
JOHN B. RICKS.

December 2, 1867.

OTHER STATE INSTITUTIONS.

BELVIDERE, *December* 9, 1868.

His Excellency, GOVERNOR OGLESBY, *Springfield, Illinois:*

SIR: Referring to our report of December 1, 1867, concerning the management of the Hospital for the Insane, I now have the honor herewith to transmit the report of the committee concerning the "financial and general management" of the "Normal University," the institutions for the "Education of the Deaf and Dumb," "Idiots and Imbeciles" and the "Blind."

I have the honor to remain, very respectfully,

Your obedient servant,

ALLEN C. FULLER,

Chairman of Committee.

NORMAL UNIVERSITY.

The establishment of this institution grew out of a practical necessity. It did not originate in the dreams or fancies of mere theorists, for the necessity of such institutions had been felt elsewhere, and plans to meet it had been adopted in other states. It was, therefore, no experiment; and the earnest educational men of the state well knew that to make its necessity fully felt here, a system of free schools must also be adopted. To that end they labored; but, prior to the meeting of the legislature in Jan-

uary, 1854, no reliable or definite expression of public opinion had been obtained on the subject.

On the 18th of February, 1854, an act was passed providing for the election of a Superintendent of Public Instruction, and defining his duties. General advisory care of common schools was committed to him; and, among the specific duties enjoined upon him, he was required to report a bill to the then next regular session of the General Assembly for a system of *free school education throughout the state*, the manner or means for the support of which system to be provided for by a uniform *ad valorem tax upon property*.

In pursuance of this instruction, a bill involving that principle was reported, and on the 15th of February, 1855, became a law. Sections 45th, 67th, and 70th of this law provide for the opening and maintenance of such schools. While this law put into practical operation a principle, it was found defective in attempting to unite what are known as the "district" and "township" systems. At the session of 1857, the whole subject was again before the legislature; and after a full discussion and consideration of it, the House, on the 5th of February, by a vote of sixty-eight to five, and the Senate, on the 11th of the same month, by a vote of sixteen to six, changed some of the details of the law of 1855, and reënacted its substantial provisions. Since that time no attempt has been made to repeal this law, and it stands upon the statute book an enduring monument of the wise foresight and public spirit of the people of the state. The fundamental and simple principle contained in it is, that *the taxable property of the state is of right, and as a matter of sound public policy, liable for the free education of the children of the state.*

At the time this law was thus decisively endorsed, there were more than a half million of children in the state between five and twenty-one years of age; and as an *additional measure*, in harmony with and constituting an important part of a complete system of common school education, the Senate, on the 4th of the same month, by a vote of seventeen to four, and the House, on the 16th, by a vote of thirty-nine to twenty-five, passed the act for *establishing* and *maintaining* a normal university.

The act named fourteen persons as corporators, under the name and style of "The Board of Education of the State of Illinois;" made the superintendent of public instruction an *ex-officio* mem-

ber and secretary of the board; required him to report to the legislature the "condition and expenditures," and such further information as the board or legislature might direct; and declared five members of the board a quorum for the transaction of business.

The board was authorized to fix the permanent location of the university at the place where the most "favorable inducements" should be offered for that purpose, provided, that the location should not be "difficult of access," or "detrimental" to the welfare and prosperity of the same.

The object of said university was declared to be, to qualify teachers for the common schools of the state, by imparting instruction in the art of teaching in all branches of study which pertain to a common school education; in the elements of the natural sciences, including agricultural chemistry, animal and vegetable physiology; in the fundamental laws of the United States and of the State of Illinois, in regard to the rights and duties of citizens, and such other studies as the board of education might from time to time prescribe.

Each county in the state was declared entitled to gratuitous instruction for one pupil in said university, and each representative district for a number of pupils equal to the number of representatives in said district. The board was authorized to appoint necessary teachers; fix their compensation, and to "*recognise auxiliary institutions*" "*when deemed practicable, provided such auxiliary institutions should not receive any appropriation from the treasury, or the seminary or university fund.*" *Discretionary* power was given to require applicants to sign an agreement that they would teach in the public schools of the state if required; and in case the applicant declined to sign such an agreement, the board was *authorized* to require payment for their tuition.

For the maintenance of the university, the *interest* of the *university* (college) and *seminary* funds, or such part as might be found necessary, were appropriated; but no part of such interest should be applied to the purchase of sites, or for buildings of said university.

The only important amendment made to the original law was made in February, 1861, in relation to representation; and provides that each county shall be entitled to gratuitous instruction for two pupils instead of one; and the board of education has authorized its president, in case any county or district neglects, to

make the appointments of pupils to which it may be entitled, to fill such vacancies.

No appropriation was made in the act of 1857 for the purchase of lands or building. "Favorable inducements" to secure its location were invited, and there is no intimation that the state contemplated making any appropriation thereafter for that purpose. Peoria and Bloomington became the principal competitors for its location; and finally, the location was secured at Normal, near the city of Bloomington, upon a subscription in money and property estimated at $103,575. Seventy thousand dollars of this was subscribed by McLean county, payable out of the sales of her swamp lands; nine thousand two hundred dollars was subscribed in lands and town lots, and eleven hundred dollars in tree and ornamental planting, and the balance—$23,275—in individual subscriptions—making the above total of $103,575.

Beside this subscription, there were donated one hundred and fifty-seven acres of very beautiful land, as a site; sixty acres of which now constitute the university grounds proper, and the ninety-seven acres lying immediately adjoining. All lands and town lots donated are still owned by the university.

On the faith of the above subscriptions and donations, the erection of the building was commenced in 1857; and after various embarrassments, delays and sacrifices on the part of the public-spirited and liberal citizens, incident to most public enterprises, the building was completed and furnished in 1861, at an expense of about $182,000. A normal school, however, was opened in the city of Bloomington in October, 1857. When the building was completed, in 1861, there had been no expenditure by the state in its construction or equipment. The board was in debt, and various liens for work and materials were impending over it. Under these circumstances, the state came to the relief of the board; but instead of making appropriations *directly*, it gave the needed relief by *indirection*. Under section six of the act of congress of April 18th, 1818, entitled, "An act to enable the Illinois territory to form a constitution and state government, and for the admission of such state into the Union on an equal footing with the original states," it was proposed to the people of the territory, in case of their admission as a state, that section number sixteen, in every township, and when such section had been sold or otherwise disposed of, other lands equivalent thereto, should be

granted to the *state*, for the use of the inhabitants of such townships *for the use of schools;* that five per cent. of the net proceeds of the lands lying within the state, and which should be sold by the federal government after January 1st, 1819, should be reserved for the following purposes, viz: two-fifths to be disbursed under the direction of congress, in making roads leading to the state, and the residue to be appropriated by the legislature of said state for the *encouragement of learning*, of which, one-sixth part should be exclusively bestowed upon a *college or university;* that thirty-six sections, or one entire township, together with the one-sixth above mentioned, should be reserved for the use of a *seminary of learning*, and vested in the legislature of the state, to be appropriated solely to the use of such seminary by the legislature.

These propositions were accepted by the people, in convention assembled, on the 26th of August, 1818; and from these sources the State realized, prior to Dec. 1, 1856, $1,054,365 06. Receiving this money for specific purposes, it was supposed by many that the faith of the State was pledged to preserve the principal intact; but as a matter of *fact*, the money was used by the state for revenue purposes, while as a matter of *book-keeping*, it appears, from the Auditor's report of Dec. 1, 1856, that the school, college (university), and seminary funds were credited by the surplus revenue fund, as follows:

School fund	$884,717 41
College	109,808 93
Seminary	59,838 72
	$1,054,365 06

The college and seminary funds being at that time $169,647 65, and the annual interest at six per cent. being only appropriated for the "maintenance" of the university, there was really but $10,178 85 set apart annually for that purpose; and one-sixth of one per cent. of this interest had in 1839 been appropriated for the education of the deaf and dumb.

The principal of the college fund was reported by the auditor, Dec. 1, 1860, to amount to $122,607 54; and it was ascertained that the interest on the principal to Jan. 1, 1857, amounted to the sum of $98,956 82. On the 14th of February, 1861, the legislature, by an act of that date, appropriated $65,000 of this interest to the university, and transferred the remaining $33,956 82 *to*

the above $122,607 54, and declared it to be a part of the same, thus increasing the principal to $156,564 36. The seminary fund still remaining $59,838 72, the interest on this and the college fund, at six per cent., constitutes the income received for the support of this school.

By this appropriation of $65,000 in February, 1861, the most pressing claims against the building were provided for, and it was supposed that no further demands upon the treasury would be necessary; but as the third section of this law of 1861, prohibited the board from selling or incumbering any of the property then owned by the board, there were in 1865 additional unpaid mechanics' liens upon the property to the amount of $32,000, which had to be provided for to save the property; and on the 14th of February, 1865, an appropriation of that amount was made.

On the 28th of February, 1867, the legislature declared the university and all its property a state institution, and that the board of education held the same in trust for the state. This act authorized the board to sell and dispose of the outlands and lots standing in the name of the board, lying in the counties of Jackson, Woodford, and McLean, except the site of the university, and the farm of one hundred acres in its immediate vicinity; and to appropriate the proceeds thereof towards refunding the following appropriations, to-wit: $1,500 to purchase a new boiler for warming the building; $1,500 annually, as salary of the curator of the Museum of the Illinois Historical Society; and $1,000 annually for expenses in improving and enhancing the value of said museum. Three thousand dollars was also appropriated, for the purpose of laying out and ornamenting the site of the university, one-half of which sum shall be paid each year for two years.

The State, then, has appropriated, for lands and building, furniture and fixtures, etc., $65,000 in February, 1861; $32,000 in February, 1865; and $5,500 in February, 1867—being a total of $102,500. For this it owns the following property: 1,500 acres of land in Jackson county; forty acres in Woodford county; five lots in Bloomington; two lots in Normal, and 157 acres in McLean county, on which the university stands. The president of the board estimates the value of this property as follows:

Jackson county lands	$10,000 00
Woodford county lands	1,000 00
McLean county lands	55,000 00
Town lots	1,000 00
University building, furniture and fixtures	200,000 00
Total	$267,000 00

The university stands upon a beautiful and commanding eminence, near the crossing of the Illinois Central and Chicago and St. Louis Railroads. The building, above the basement—which is built of heavy blocks of Joliet cut stone, is of brick, three stories high, exclusive of the basement. It is 156 feet long and 100 feet wide, fronting to the south, the central part of the north and south sides falling back a few feet, for architectural appearance, and affording room for piazzas. It is warmed by forcing steam through pipes, leading from the engine rooms to various parts of the building; and its ventilation, with the exception of a part of the west end of the basement story, appropriated to water-closets, appears good. The basement, 10½ feet in the clear, is occupied as a janitor's house, gymnasiums, chemical lecture rooms, office and laboratory; the first story, fifteen feet in the clear, for model school rooms, dressing rooms, and reception room; the second story, sixteen feet in the clear, for an assembly and class rooms; and the third story, twenty feet in the clear, for a museum of the State Natural History Society, society rooms, library, and gallery of art, and normal hall. In the attic are two large rooms filled with water, forced there from cisterns in the rear, by the steam engine in the basement. Water-pipes run from this reservoir to various parts of the building, by means of which the water can be instantly used to flood the halls and rooms in case of fire.

It appears to be well arranged for the purposes designed, and is of imposing appearance. Is is claimed to be the best normal school building in this country.

The board of education in their report of Dec. 14, 1865, state the total amount expended for buildings, fixtures, apparatus and furniture, to be $190,000. It appears, from a report made by the committee on state institutions to the House, on the 15th of February, 1865, that of the total subscription of $103,575, above referred to, $93,795 of this was subscribed by McLean county and citizens of that county, payable in money; and that of this latter amount $91,465 was actually paid.

When it is remembered that a general financial disaster swept over the country during the erection of the building, it is not surprising that losses to the amount of a few thousand dollars were sustained, nor that there should have been delays and other losses, arising from converting property subscribed into money.

The committee do not regard it of much practical importance to attempt now to ascertain the exact cost or value of the building, (unless there was extravagance or dishonesty in expending the money) or the present value of the 160 acres of land surrounding the building, for neither the sixty acres upon which the university stands, and 17 acres of the 97 acres adjoining, could be converted into money, even if the state desired to do so. The title to this land is held by the board, subject to the condition of its being used as a site of the university, and might be forfeited by *non user*. Although these two pieces cannot be diverted to any other purpose, yet, in the opinion of the committee, it might be a good policy to sell the 80 acres, and use the proceeds as an endowment fund; still, whether any of it shall be sold or not, the entire property, as it now stands, is an honor to the state, and may, if properly managed, constitute a priceless legacy for our children.

From such information as the committee have been able to obtain, they suppose the 1,500 acres of land in Jackson county are worth from $8,000 to $10,000; that the 40 acres in Woodford county are worth $1,000; and that the town lots are worth $1,000 —making about $12,000, which sum may, before long, be realized by a sale now authorized to be made.

The committee have discovered no evidence of extravagance in the furniture or fixtures. The recitation and assembly rooms are plainly and comfortably furnished, but economy seems to have been very rigidly applied to other rooms. In fact, there is very little furniture in them. The reception room is generously furnished with a carpet to *stand upon*, but no chairs or benches are provided for seats. What amount has been expended respectively for furniture and fixtures, or in the construction account, the committee were unable to ascertain, except from general statements found in the report of the board, without examining in detail vouchers on file.

It appears that all accounts, before being paid, are presented to the board, and allowed, and an order is then drawn by the president of the board on the treasurer. The account kept by the

treasurer is a mere deposit account with the board. The superintendent of public instruction is not, as *secretary* of the board, necessarily its book-keeper. In fact, his residence by law and in fact is at the capital of the state, and he could not, if he were willing, act as book-keeper. The proceedings of the board show the accounts allowed, and their character, but the committee were surprised to be informed that no journal and ledger were kept. They have no doubt that as a matter of history, and to avoid mistakes, a journal should be opened, in which should be entered all the accounts of the university, from its commencement to the present time, and posted in a ledger, under appropriate individual and general heads, and that such journal and ledger should be regularly kept hereafter. The expense of doing this will be small indeed it is not improbable that no other expenses than the purchase of the books would be required, and that pupils in the normal department might, under the direction of some one of the faculty, profitably devote the hour each day, which they are now required to teach in the model department, to opening and keeping such books, and thus, in fact, be benefited by obtaining very useful information in practical book-keeping.*

It appears from an abstract, made by the superintendent of public instruction, of the receipts and disbursements by the treasurer for 1865 and 1866, that there was received in 1866, for rent of farm and rooms, $267 33, and for grass sold, $61; and $1,200 was paid in 1866 for insurance on $60,000 to 1871.

A statement appears in the journal of the committee, prepared by Walter M. Hatch, Esq., showing that policies of insurance to the amount of $60,000 have been issued, which expire at different dates in 1871; and also a full description of the real estate owned by the state.

It is not proposed here to dwell at length upon what has been accomplished by this enterprise, or what influence it has exerted upon the educational interests of the state. In the opinion of the committee it is altogether too late to discuss the propositions as to whether free schools are a blessing to the people of this state, or whether a school for the instruction of persons in the art of teaching is a necessary part of a complete educational system. These propositions are of the past, and are no longer open ques-

* NOTE.—The account books recommended to be opened and kept, have, since the meeting of the committee, been provided, as appears by a letter to the chairman of the committee from the superintendent of public instruction.

tions. To argue them now, would be no less a waste of time and labor, than to attempt to prove that a refined and educated civilization is superior to barbarism, or that skilled labor or a disciplined and cultivated mind, which comprehends the origin and relation of the material universe, and takes hold on eternal things, is superior to unskilled labor, and that blank, stolid ignorance which looks out upon the world and merely wonders what it all means, without a thought or care or apprehension of anything beyond the temporary satisfaction of physical wants, and the indulgence of untamed passions.

It is, however, of importance to the continued support of the institution, that its affairs should be so managed as to entitle it to the fostering care of the state, and that the people of the state should understand the general facts, and have confidence in its management.

The school was opened in rented rooms, in October, 1857, and has been in operation ten years. There has been expended by the state, in its maintenance, $114,189 65, by way of interest due on the college and seminary funds, as follows:

Interest due	January,	1858	$9,754 74
"	"	1859	9,821 44
"	"	1860	9,821 44
"	"	1861	11,281 04
"	"	1862	11,281 04
"	"	1863	12,445 99
"	"	1864	12,445 99
"	"	1865	12,445 99
"	"	1866	12,445 99
"	"	1867	12,445 99
			$114,189 65

Or an average annual expenditure of $11,418 96.

If there is any argument or proof to be found in educational statistics, in this state, it may be very confidently assumed that this small annual expense will be most willingly paid by a people who, during the past decade, have done so much for the promotion of popular education. The statistics show that during the past ten years, the two-mill tax has amounted to $6,886,165, and that in addition to this over $13,000,000 have been raised, for various school purposes, by voluntary local taxation, and of this latter sum, $2,789,335 was raised in 1866. It further appears that there were last year 9,945 schools in the state, and that out

of 768,263 persons between the ages of six and twenty-one years, 614,659 attended schools, and that there were 17,279 teachers.

A cause must be very dear to the heart of a people, which secures such a tribute during ten years, and that time, too, covering a period of terrible civil war, which called fifteen per cent. of their number to the field.

The following tabular statement will show the general numerical results of the university, in the normal department:

Counties.	Total No. Admitted.	No. in Attendance.	Counties.	Total No. Admitted.	No. in Attendance.
Adams	12	2	Jasper	..	..
Alexander	7	..	Jefferson	4	..
Bond	6	1	Jersey	3	1
Boone	13	8	Jo Daviess	8	4
Brown	5	3	Johnson	4	..
Bureau	19	1	Kane	18	2
Calhoun	1	1	Kankakee	12	7
Carroll	3	1	Kendall	10	1
Cass	5	1	Knox	10	3
Champaign	34	12	Lake	5	2
Christian	18	..	LaSalle	49	10
Clark	6	3	Lawrence	4	..
Clay	6	1	Lee	16	1
Clinton	4	3	Livingston	18	6
Coles	20	7	Logan	25	13
Cook	16	3	Macon	14	2
Crawford	4	1	Macoupin	15	2
Cumberland	5	..	Madison	14	4
DeKalb	14	5	Marion	20	2
DeWitt	38	9	Marshall	10	..
Douglas	4	2	Mason	15	1
DuPage	5	..	Massac	7	2
Edgar	5	..	McDonough	13	..
Edwards	..	..	McHenry	15	5
Effingham	7	..	McLean	241	60
Fayette	13	4	Menard	4	1
Ford	3	3	Mercer	5	..
Franklin	..	..	Monroe	2	2
Fulton	28	3	Montgomery	5	1
Gallatin	3	..	Morgan	6	..
Greene	6	1	Moultrie	2	..
Grundy	8	3	Ogle	30	6
Hamilton	8	..	Peoria	60	9
Hancock	15	2	Perry	7	1
Hardin	..	..	Piatt	7	2
Henderson	14	..	Pike	35	5
Henry	10	3	Pope	3	2
Iroquois	3	1	Pulaski	5	..
Jackson	3	..	Putnam	35	9

Counties.	Total No. Admitted.	No. in Attendance.	Counties.	Total No. Admitted.	No. in Attendance.
Randolph	3	..	Wabash	..	..
Richland	..	..	Warren	16	..
Rock Island	15	1	Washington	16	2
Saline	3	..	Wayne	2	..
Sangamon	24	1	White	9	..
Schuyler	15	1	Whiteside	8	5
Scott	8	2	Will	26	4
Shelby	8	1	Williamson	3	..
Stark	6	1	Winnebago	15	2
St. Clair	9	..	Woodford	23	4
Stephenson	16	5	Counties unknown	21	..
Tazewell	38	18	Other States	40	19
Union	8	2			
Vermilion	4	2	Total	1463	320

The average attendance per pupil has been about fifteen months. Number of graduates, eighty-one.

From the above it will be seen that there have been 1463 persons instructed in the art of teaching, and that 320 were, Nov. 26, 1867, in the normal department. It is estimated that in addition to those who enlisted in the army, from three-quarters to seven-eighths of these pupils have been engaged in teaching in the schools of the State; and the correspondence on file most clearly shows, that while some have failed for want of natural ability or temperament, these normal teachers have generally ranked higher than other teachers and have been acceptable to the schools and school officers. Among the many evidences of this, is a constantly increasing demand for them from different parts of the State, and that, too, greatly beyond the supply.

Under the sixth section of the act of incorporation, authorizing the board to "recognize" auxiliary institutions, when deemed "practicable," provided that such auxiliary institutions should not receive any appropriations from the treasury, or seminary, or university fund—there has been established what is called a model school. This school is divided into four grades—the high, grammar, intermediate, and primary schools, each of which is under the charge of a principal, specially employed for that purpose.

These teachers are assisted in part by permanent teachers, and in part by pupils of the normal school—every pupil in the normal school being required to teach one hour each day in the model school four terms before graduation. This model school is a school of observation and practice, and is established to enable the normal pupils to witness the various methods of teaching, and participate in the *practice of teaching while yet pupils themselves.*

It has been supposed, by many, that some portion of the fund appropriated for the support of the normal school, is used for the support of the model school, and that there are local pecuniary advantages to those residing in the vicinity of the university, in the use of this fund for the support of their common schools. This, the committee are satisfied, is a mistake.

In the first place the law expressly forbids it; and the committee believe that the board of education have in this, as in every other official act, studiously, and faithfully, and with singleness of purpose, endeavored to carry out, in good faith, both the letter and spirit of the law. A statement submitted by the principal of the university shows that the amount received last year from the normal school district, for teaching district scholars and from tuition, was about $3,500 more than the expenses; and that the receipts and expenses of the model school for the present year will be about as follows:

Tuition of non-resident scholars	$4,415
From school district	2,800
	$7,215
Total amount of salaries (from regular teachers, and two who teach a part of the time)	4,200
	$3,015

The normal faculty consists of five professors and one instructress. The president receives an annual salary of $3,000, and the other professors $1,500 each, and the instructress $900, making total annual salaries $9,900. The professors are all married men; and the average period of service of the faculty is six years.

The number of normal pupils is 320, an excess of seventy-five over any previous attendance; and the number in the model school is 535, an excess of 175 over any previous attendance.

As the total amount received from the State is $12,446, and the salaries of the faculty are $9,900, there is a balance of only $2,546 for janitor's fees, fuel, stationery, expenses of members of the board, etc. The heating costs about $2,300, and of course there is a deficit; but this deficit has been made up from the proceeds or profit of the model school—*showing that the model school contributes to the support of the normal school*, instead of being a tax upon it. This amount of surplus, however, cannot probably be relied upon in the future, for it is believed that the services of the teachers in the model school cannot be retained, at the salaries now paid them.

The salary of the principal of the high school is $1,400; that of the principal of the grammar school, $1,000; principal of primary school, $650; intermediate school, $550; assistant teacher in high school, $400, and an assistant in grammar school, $200. The two latter are, however, only employed a part of each day.

In relation to salaries of the faculty in the normal school, the president of the board submitted to the committee a memorial of the faculty, except the president, addressed to the board on the 7th of September last, and a letter of Professor Edwards on the subject, dated Nov. 13, 1867. These communications, with one of the president of the board, may be found in the journal of the committee. The statement, in these papers, of salaries paid for similar services in other states, and to teachers in schools in different parts of this state, would seem to be conclusive that the salaries paid elsewhere are much greater than in our normal school. As the committee have no power to act in relation to this matter, they can only express the opinion that these salaries are very low; and that the board of education will be compelled, as soon as they may be provided with additional means, to increase these salaries or part with the members of their faculty—a result which, it seems to the committee, would be likely to be extremely prejudicial to the efficiency and usefulness of the university, and the occasion of a very general and sincere regret to the people of the state, in whose service this corps of faithful and competent teachers have been so long and successfully employed. They have acceptably filled their respective chairs for several years; and thus, and by their public lectures and services in school institutes, become very generally acquainted and identified with the teachers and educational men of the state. The utmost zeal and harmony appear to

prevail among them. They have families. At the present time their salaries are barely sufficient to support them, and the application, and the reasons given by them, for an increase of their salaries, appear to be worthy of careful consideration.

ALLEN C. FULLER,
ANDREW J. HUNTER,
ELMER BALDWIN,
T. B. WAKEMAN.

The undersigned, member of your committee, does not feel warranted in signing or indorsing the above report of the majority of your committee, without making the following additional or supplemental statement of facts not embraced in the report as it now stands:

I find, on inspection of the model or auxiliary department of the normal university, that negro and mulatto children are admitted and recognized as model pupils of this state institution.

Such unnatural and forced association of black children in the same school-room with white children is a grave and important question, which should be considered at once by the state board of education. To them, together with the superintendent of public instruction, belongs the entire question. It is with them to make the change, or continue the same custom and rule—their duties being clearly defined by the act of incorporation directing how the institution shall be conducted. Therefore I cannot feel authorized in directing or controlling their course of duty in this matter, but would earnestly suggest that this indiscriminate and reckless breach upon the long-established free white system of education throughout the state be corrected. Hoping not only that the state board of education will at once use every effort to make the normal university a white institution, and that the normal faculty should unhesitatingly assist them in such reform.

Feeling assured that our duties to the state, as a committee, are fully discharged when the whole facts are presented in accordance with the resolution prescribing our duties, consequently I shall not enter into argument or expression of mere opinion, but submit the report and supplemental to the consideration of an honest and candid public opinion.

ANDREW J. HUNTER.

DEAF AND DUMB INSTITUTION.

The institution for the education of the deaf and dumb was incorporated by an act of the legislature, approved Feb. 28, 1839. The school was opened January 26, 1846. There have been several acts passed in relation to this institution, but as there have been no controversies or general discussions concerning any of their provisions, and no complaints of mismanagement of its affairs have reached the committee, reference will here only be made to a few of the more important provisions of these laws.

The act of 1839 provided that the institution should be located at an eligible site, within four miles of Jacksonville, provided a donation of five acres of suitable ground could be procured, within said distance.

In order to "aid the funds" of the institution, a sum not exceeding one quarter of one per cent. of the interest on the school, college and seminary funds was appropriated. These funds at that time amounted to $749,996 02, and six per cent. being the amount of interest which the state paid upon them, the annual amount appropriated by this act was $1,874 99. In February, 1847, the above appropriation was increased $3,000 annually.

The object of the institution was declared to be, to provide by all feasible means for the intellectual, moral and physical culture of that unfortunate portion of the community, who had been born, or who by disease had become, deaf and dumb. The original act provided further that the "indigent" deaf and dumb who were received, should be provided with board, lodging and tuition gratuitously, so far as the funds of the institution would permit; but after the school had been in operation about three years, and had received about sixty pupils, the law in relation to paying pupils was, on the recommendation of the directors, changed; and by the third section of the act of February, 1849, all deaf and dumb residing in the state, of suitable age and capacity to receive instruction, were declared entitled to receive the benefits of the institution without charge.

By the tenth section of an act of February 13, 1857, it is provided that where parents of pupils sent to the institution were too poor to furnish them with good and sufficient clothing, or where

pupils were without parents, and unable to furnish it themselves, the judge of the county court of the county from which they were sent should certify the same to the principal, who should procure the same, and charge the same to the county.

On account of this change of policy, in making the institution free, increased appropriations were required, and in the same and subsequent acts they were made, both to enable the directors to increase the accommodations for the reception of pupils, and meet the current expenses of the institution.

In February, 1851, the legislature provided for an additional "fund," which should consist of one-sixth of a mill upon each dollar's worth of taxable property in the state, which one-sixth was to be deducted from the two-mill tax then in force for revenue purposes, and set apart for this institution; but no more than $120 of said fund should be paid or used annually for the support of each state pupil; and the excess of said fund should be used in the erection of the north wing of the building, until that was completed, and thereafter be transferred to the treasury for ordinary revenue purposes.

This law remained in force until February 14, 1855, when it, and so much of any other acts as authorized the levying of a special tax for the support of the institution, were repealed, and a new policy of supporting the institution by direct appropriation instead of by special taxes, was supposed by many to have been inaugurated.

An examination of the present laws in relation to this institution will, however, show that there are still two sources of receipts. So much of the law of 1839 which appropriated one-fourth of one per cent. of the interest of the college and seminary fund to the support of this institution was, in effect, repealed by the law of 1857, incorporating the normal university, *but was re-enacted and continued* at the last session of the general assembly, so that this institution now receives the same interest on the school, college and seminary funds, as under the original act of 1839. The annual interest on these funds is $2,913 51, which, added to $45,000 annually, as provided by the law of 1867, makes the annual amount of aid by the state $47,913 51, for the years 1867 and 1868.

It appears from the reports, books and papers of the institution, that there has been expended, for grounds, buildings, improvements and repairs, the following sums. (The original site of six

acres was presented to the institution by the citizens of Jacksonville :)

1842	$6,995 50
1843–44	4,353 43
1845–46	4,773 82
1847–48	5,560 65
1849–50	15,691 65
1851–52	15,882 33
1853–54	30,967 11
1855–56	26,863 64
1857–58	41,158 00
1859–60	3,566 26
1861–62	12,591 14
1863–64	9,572 13
1865–66	21,144 74
1867 (appropriation)	5,900 00
Total	$204,920 40

Of this amount, $6,623 60 was paid for land, including $989 50 contributed by the citizens of Jacksonville for the purchase of a site for the institution.

There are fifty-five acres of beautiful and well-cultivated land, belonging to the institution, lying about one mile from the court house, in Jacksonville, suitably divided into lawns, flower and vegetable gardens, and farm land. It is believed that this is all the land that is required, or can be advantageously used by the institution.

The main edifice of the institution is 236 feet front, and faces to the east. The central part of the building is 61 feet front, and 72 feet deep. The north wing is 91 feet front, each lateral section of which is 50 feet deep, and the transverse section 72 feet deep, the front and rear projecting 11 feet from the lateral section. The south wing is 84 feet front, and fifty feet deep—the front and rear lines falling back 13 feet from the front and rear lines of the central part of the building. The building is three stories high above the basement. The basement and first story are of cut stone, and the second and third stories are of brick. Though time and experience have suggested several changes which doubtless would be made, if a building for the same purpose was now to be constructed, yet with the exception of the south wing the building is comfortable, and tolerably well adapted to the purposes intended, and upon the whole is a very delightful home for those who occupy it. The south wing is, in some respects, a failure, its walls have cracked, and doubtless before long the comfort and

safety of the occupants will require that they be torn down and rebuilt. The basement is 8 feet high in the clear, and each of the three stories 12 feet in the clear. This building is conveniently divided into apartments for household and domestic purposes, school-rooms, offices, and reception rooms, and a chapel which is in the third story.

About 100 feet in the rear is an engine-house, of brick, 60 by 30 feet, three stories high above the basement. The basement is occupied as an engine-room; and the balance of the building for wash, ironing and drying rooms. A part is occupied as a hospital. There is also a brick barn, 60 by 42 feet, cost $2,978; and a cabinet and shoe shop, one story high, 100 by 23 feet, costing $2,687.

The principal building is warmed by steam-pipes, connecting with the main pipe, running from the engine house, and upon the same principle as that at the hospital for the insane, heretofore described in the report of the committee upon that institution. The ventilation is through the doors and windows, which are so arranged that such ventilation is very good.

The water used is from wells and cisterns, which have not afforded a sufficient supply, for ten years past, in the winter season. At the present time there is a serious inconvenience, for the want of a supply.

At the last session of the legislature, an appropriation of $1,800 was asked, for the purpose of securing an additional supply of water, from a large well upon a piece of land near the institution, lately purchased by the directors, on account of this well. The appropriation was made, but no part of it has been expended. The directors propose, however, to expend so much of it as may be necessary, as soon as some satisfactory and feasible plan can be adopted for that purpose. It is thought this will furnish an ample supply.

It also appears, from the books, papers and reports of the institution, that there have been expended in its support, since its opening, January 26, 1846, the following sums:

1845–46	$2,947 54
1847–48	16,106 45
1849–50	18,638 74
1851–52	23,966 47
1853–54	25,046 28
1855–56	30,053 54
1857–58	51,710 46

1859–60	$52,758 11
1861–62	59,587 92
1863–64	70,951 90
1865–66	93,146 02
1867	51,733 08
Total	$491,643 51

The general account will then stand:

Expended for lands and buildings	$204,920 40
Current expenses	491,643 51
Total	$696,563 91

The total number of pupils received into this institution is 675, —twenty-four of whom were from other states—leaving 651 from our own state. Two hundred and thirty from this state, and one from Arkansas, are now in the school.

The total expenditure by the state, including land and buildings, is about $1,070 per pupil; and the total amount expended by the state in current expenses, is about $755 per pupil. The current expenses of 1865 and 1866 being, as above shown, $93,146, or $46,578 per year, and the average attendance 180, the expense per pupil was $258 74 per annum. The total expense per pupil, for the year 1867, is stated by the principal at $265, which is about $10 more annually for each pupil, than the average expense of several other institutions of similar character, whose reports the committee have examined.

Of the $51,733 08—current expenses for 1867—$13,922 50 was paid for salaries; $4,043 08 for wages; and $33,767 50 for ordinary expenses.

The summer vacation includes the months of June, July, August and September. The fiscal year ends November 30th, and the year for school purposes ends in May. The school is taught thirty-five weeks each year; and the pupils, with very few exceptions, spend the vacations at home or among their friends.

As the average attendance for the year ending May, 1867, was 180, and the number of pupils in school November 30, 1867, was 231, the average attendance for the present school year will be considerably greater than the last year. And as very little, if any, additional expense for teachers and employees will be required, it is believed the average expense for the fiscal year ending November 30, 1868, will be about $250 for each pupil. Should this be the case, and the average attendance be 240, which

is the maximum number which can be accommodated, then the total expense will be about $60,000. As this would be about $7 per pupil for each week during which the school is kept, the amount seems large; but when it is considered over 30 per cent. of the current expenses is on account of salaries and wages, and which cannot be much reduced during vacation, it will be seen that the amount is not very high.

The following are the officers and employees, with their annual salaries and wages, now employed in the institution:

1 Principal	$1,500 00
7 Male teachers	5,820 00
5 Female teachers	2,300 00
3 Matrons	1,100 00
1 Clerk	800 00
1 Physician	360 00
1 Superintendent cabinet shop	700 00
1 Superintendent shoe shop	812 00
1 Engineer	600 00
1 Fireman	360 00
1 Gardener	800 00
1 Baker	480 00
1 Teamster	360 00
1 Porter	360 00
3 Cooks	744 00
2 Dining-room girls	288 00
1 Nurse	156 00
1 Laundress	156 00
2 Chamber maids	288 00
1 Visitor's attendant	144 00
	$18,128 00

The system of instruction in this institution was introduced into this country in the year 1817, by Dr. Gallaudet, and known as the system of De L'Epee or Sicard. It is claimed by the teachers of deaf mutes, in this country, to be superior to any other. The principal, however, informed the committee that he will be ready to adopt any other system of instruction in this school, whenever it shall be found to surpass the one now in use. It is, of course, a language of signs, with which the committee have no knowledge; and they can only join their congratulations with those of the thousands of their fellow-citizens in different parts of the state, who have witnessed the wonderful proficiency of many of these pupils, that an institution of such great efficiency and usefulness has been established, and is now so successfully dispensing its blessings to these silent sons and daughters of our state.

Concerning the government of the institution, the committee, having spent a few days at the institution during the past summer; have some personal knowledge; and they would do injustice to their own feelings, if they did not commend it to the unqualified confidence of the people of the state. The organization of the institution seems to approximate as nearly as possible to the family. The easy and unrestrained intercourse of officers and pupils, without unseemly familiarity, evinces the mutual confidence and regard that are generally considered as peculiar to a well-regulated family. No elaborate code of by-laws and regulations for the government of the institution has been adopted. Its discipline appears to be kind but firm, and the few simple rules in force are founded upon the idea, that it is for the happiness of the pupils to conform to them, instead of the idea that severe punishment will follow their violation. The school is, indeed, a well regulated family; and the uniform confidence, respect and affection manifested by the pupils to their worthy and exemplary corps of officers, show that the law of love is the bond and sign which controls them all, in their silent labors from year to year.

It is estimated by the principal that there are about 1,500 deaf mutes in the state, and that of that number about *one-third* are of suitable age to attend this school. Deducting from this number 231 now in the school, and there will still be 269 remaining unprovided for. The average age of the 231 now in school is about fourteen years.

Of this number (144) seventeen are enrolled as pupils of the institution, but for various reasons are kept at their homes—which reduces the unprovided for to 127.

SCHOOL FOR IDIOTS AND IMBECILES.

Under the provisions of an act approved Feb. 15, 1865, an experimental school was authorized to be established, for the instruction and training of idiots and feeble-minded persons in this State, and was placed under the charge and direction of the directors of the institution for the instruction of the deaf and dumb.

Five thousand dollars per annum, from March 1, 1865, to March 1, 1867, was appropriated; and the school was opened May 25, 1865.

Under the act of Feb. 28, 1867, the sum of $14,000 per annum, from March 1, 1867, to March 1, 1869, was appropriated, for ordinary expenses, and $8,000 for an additional building. The premises occupied by this school are rented, and the directors have secured the privilege of removing the building, contemplated by the appropriation, at their pleasure during the term of their lease.

The building has been erected, for which the above $3,000 was appropriated, and this sum, together with $10,000 expended in 1865 and 1866, and $14,000 for current expenses for 1867, makes the total amount expended about $27,000.

This school, commenced under the auspices of the directors of the deaf and dumb asylum, was an experiment. It is no longer an experiment. It is a success. Like other charitable institutions its field of operation is the state. There have been 171 applications made, by citizens of this state, for admissions. Fifty have been admitted; and there are now thirty-nine in attendance. The latter will be increased to sixty by the first of January, 1868. The school is near the institution for the deaf and dumb, and its location is a very delightful one. It is under the direct superintendance of Dr. C. T. Wilber, whose accomplishments, and zeal which he brings to the service, and the ambition he appears to have for making the school a permanent institution, afford a most encouraging guaranty that great good will be accomplished. His valuable and interesting report of December, 1866, to the directors, showing the operations of similar institutions in other states, and the proficiency made by his own pupils, constitute a strong appeal and encouragement for increased aid from the state, in behalf of this important enterprise.

ALLEN C. FULLER,
ANDREW J. HUNTER,
ELMER BALDWIN,
T. B. WAKEMAN.

The following tabular statement shows the number of pupils admitted—the number now in attendance—and the amount paid for clothing, by counties, respectively:

DEAF AND DUMB.

Counties.	Total No. pupils...	Now in attendance.	County pupils now in attendance ...	Clothing by counties.....
dams	33	9	6	$761 45
lexander	4	3	2	.....
ond	6	1	1	.....
oone	1	.....	.....	29 15
rown	4	1	.....	188 65
ureau	6	5	.....	.....
alhoun	1	.....	.....	.....
arroll	3	1	.....	.....
ass	5	1	.....	.....
hampaign	11	11	4	230 64
hristian	1	.....	.....	.....
lark	2	1	.....	45 00
lay	2	.....	.....	.....
linton	5	1	.....	.....
oles	10	2	.....	57 25
ook	37	17	5	577 35
rawford	4	2	.....	.....
umberland	3	1	.....	.....
eKalb	2	1	1	70 15
eWitt	6	.....	.....	46 35
ouglas	1	1	.....	.....
uPage	5	2	.....	.....
dgar	5	1	.....	.....
dwards	.....	.....	.....	.....
ffingham	4	1	.....	27 60
ayette	3	.....	.....	.....
ord	1	3	.....	.....
anklin	1	.....	.....	.....
ulton	7	1	.....	.....
allatin	2	.....	.....	.....
reene	4	1	.....	.....
rundy	3	2	1	.....
amilton	3	3	1	.....
ancock	16	7	1	74 75
ardin	1	.....	.....	.....
enderson	5	2	.....	52 65
enry	13	7	1	75 92
oquois	2	1	.....	.....
ackson	7	3	2	.....
asper	2	.....	.....	.....
efferson	2	.....	.....	.....
ersey	1	.....	.....	.....
oDaviess	3	1	.....	86 83
ohnson	1	.....	.....	.....
ane	6	4	3	303 75
ankakee	4	3	2	.....
endall	2	1	.....	.....
nox	12	4	1	169 16
ake	3	2	.....	.....
aSalle	14	6	1	79 35
awrence	2	2	.....	.....

Counties.	Total No. pupils...	Now in attendance.	County pupils now in attendance....	Clothing by contributions.....
Lee	1			$27 00
Livingston	3	3	1	40 45
Logan	4	2		
Macon	7	3	2	73 60
Macoupin	14	5		
Madison	13	1	1	99 27
Marion	6	5		
Marshall	8	2	1	
Mason	8	2		
Massac	1			
McDonough	9	4	1	71 15
McHenry	4	1		
McLean	7	2		69 96
Menard	12	4	1	99 80
Mercer	6	1		145 47
Monroe	3			
Montgomery	12	8		166 50
Morgan	48	10	3	208 96
Moultrie	2	1		
Ogle	6	4		
Peoria	14	5	3	105 70
Perry	1	1		
Piatt	1			23 00
Pike	17	2	1	
Pope				
Pulaski	1			
Putnam	5	1		
Randolph	4	3	1	
Richland	9	4	1	
Rock Island	8	4	1	37 00
Saline	2	1		
Sangamon	20	6	2	143 05
Schuyler	2			
Scott	3	2		
Shelby	3	2		
Stark	1			
St. Clair	3	2		84 55
Stephenson	4	1	1	171 27
Tazewell	14	2		
Union	2			
Vermilion	3	2	2	50 80
Wabash	2	1		
Warren	10	1		
Washington	10	3	3	
Wayne	2	1		
White	1	1		
Whiteside	3	2		
Will	17	6	2	40 00
Williamson	1			
Winnebago	3	4	2	147 25
Woodford	3	1		

States.	Total No. pupils	Now in attendance.	County pupils now in attendance	Clothing by counties
rkansas	1	1		
Visconsin	2			
)wa	7			
lissouri	14			
	675	231	61	$4,680 28

IMBECILES.

Counties.	Total number of applications received up to Nov. 30, 1867	Total number that have been connected with the Institution up to Nov. 30, 1867	Total number now in the Institution, Nov. 30, 1867
Adams	2		
Alexander	1		
Bond	2	1	1
Boone	3		
Brown	1		
Bureau	2	1	1
Calhoun			
Carroll	4	1	1
Cass	3		
Champaign	2	1	1
Christian	1		
Clark	1		
Clay	1		
Clinton			
Coles			
Cook	26	5	5
Crawford			
Cumberland			
DeKalb			
DeWitt	2	1	1
Douglas			
DuPage			
Edgar	1	1	1
Edwards			
Effingham			
Fayette			
Ford			
Franklin			
Fulton	1		
Gallatin			
Greene	2	2	2
Grundy			

Counties.	Total number of applications received up to Nov. 30, 1867	Total number that have been connected with the Institution up to Nov 30, 1867	Total number now in the Institution Nov. 30, 1867
Hamilton			
Hancock	2	1	1
Hardin			
Henderson			
Henry	3		
Iroquois			
Jackson	3	1	1
Jasper			
Jefferson			
Jersey	1		
Jo Daviess	2		
Johnson			
Kane	1	1	
Kankakee	2	1	1
Kendall			
Knox	7	1	1
Lake	2		
LaSalle	8	4	3
Lawrence	2	1	1
Lee			
Livingston	1	1	
Logan	1		
Macon	2	1	
Macoupin	3	3	3
Madison	3		
Marion	2		
Marshall	1		
Mason	2		
Massac			
McDonough	2	1	1
McHenry	1		
McLean	6	2	2
Menard	3		
Mercer			
Monroe	1		
Montgomery	1		
Morgan	9	4	2
Moultrie			
Ogle	4		
Peoria	5	3	3
Perry			
Piatt	1		
Pike	3	1	1
Pope	1		
Pulaski	1		
Putnam			
Randolph			
Richland	1		
Rock Island			
Saline			
Sangamon	6	2	

Counties.	Total number of applications received up to Nov. 30, 1867....	Total number that have been connected with the Institution up to Nov. 30, 1867.....	Total number now in the Institution, Nov. 30, 1867 .....
Schuyler			
Scott	3	1	
Shelby			
Stark			
St. Clair	2	1	1
Stephenson	2	1	1
Tazewell	1		
Union			
Vermilion			
Wabash			
Warren			
Washington	1		
Wayne			
White			
Whiteside	2	1	1
Will	7	1	1
Williamson	1	1	
Winnebago	4		
Woodford			
Arkansas	1		
Indiana	2		
Iowa	4	2	2
Michigan	1		
Missouri	1	1	1
Tennessee	1		
Wisconsin	3		
	184	50	39

INSTITUTION FOR THE BLIND.

The institution for the education of the blind was organized under an act of January 13, 1849, which appointed five trustees to manage its affairs. The second section of the act declared the object of the corporation to be to continue and maintain the school for the education of the blind, established in Jacksonville, and to qualify, as far as practicable, that unfortunate class of persons for the enjoyment of the blessings of free government, obtaining the means of subsistence, and the discharge of those duties, social and political, devolving upon American citizens. The 5th and 16th

sections declared that all blind persons residing in Illinois, of suitable age and capacity to receive instruction, shall be received and taught in said school, and enjoy all the benefits and privileges of the same free of charge.

The trustees were required, as early as practicable, to purchase, in or near Jacksonville, a suitable lot of ground, containing not less than ten nor more than fifty acres, and proceed to erect thereon a suitable building, and make such arrangements as were necessary for the school. For this purpose three thousand dollars were, by the 14th section of the act, appropriated "to aid in the establishment of the school;" and by the 12th section it was further provided that there should be paid to the trustees, for the use of the institution, the proceeds of a tax of one-tenth of a mill upon the taxable property of the state. This 12th section, creating the tax, was repealed February 14, 1865.

The trustees appointed by the act immediately organized, and in April of the same year seven pupils were received, in temporary quarters provided for them. During the same summer the present site, in the eastern part of the town of Jacksonville, and consisting of twenty-two acres of land, was purchased of the estate of Col. Hardin, for $1,683 75; and in January, 1854, the building now standing upon said site was occupied for school purposes.

The main edifice is of brick, fronting to the south, 116 feet long, and 66 feet deep, and is five stories high. The first story or basement is two feet above the surface of the ground, and 12 feet high. The second story or main floor is also 12 feet high; the third 11 feet; the fourth 15½, and the fifth 11 feet high; and under the whole building is a cellar 8 feet deep.

The building is well heated by four hot air furnaces in the cellar. There is no other provision for ventilation except outside openings.

There is also upon the premises a workshop, of brick, two stories high, 60 by 30 feet; a laundry and bake-house, of brick, two stories high, 48 by 25 feet, and a frame barn, 75 by 25 feet.

It appears from various reports, books and papers on file, that the following sums have been expended for building and improvements:

In 1849–50	$3,863 11		
1851–52	31,159 26		
1853–54	28,583 52		
1855–56	7,149 36		
1857–58	5,665 79		
1859–60	2,396 08		
1861–62	2,866 99		
1863–64	1,011 96		
1865–66	3,704 13		
1867	3,855 58		
			$90,255 78
For current expenses:			
1849–50	$5,856 21		
1851–52	11,510 47		
1853–54	16,761 70		
1855–56	20,946 78		
1857–58	24,768 79		
1859–60	26,477 88		
1861–62	25,020 00		
1863–64	27,862 32		
1865–66	35,645 25		
1867	25,043 37		
		$219,892 77	
Less received from sales of manufactured articles, and receipts at institution to Dec. 1, 1867,		21,403 22	
			198,489 55
			$228,745 33

Since the opening of this school, in 1849, there have been three hundred and one pupils admitted; and prior to December 1, 1866, one hundred and ninety-nine had completed their course of instruction and returned to their homes; and five had died. There are now in the institution eighty-two, and that number is all that can be comfortably accommodated.

It will thus be seen that there has been expended, for lands, buildings and current expenses, about $960 for each pupil received; and as *current expenses* for each pupil received, about $660.

The current expense account for year ending December 1, 1867, was $25,043 37, less $1,927 39, received from sales, etc.; and the average attendance, 80; showing the annual expense, per pupil, for past year, was $228. The school is taught 42 weeks each year, and the friends of the pupils are required to take charge of and provide for them during vacation.

There are at present employed at the institution the following officers and employees:

1 Superintendent, annual salary	$1,000	and board.	
1 Matron	"	400	"
1 Ass't Matron	"	250	"
1 Assistant in shop	"	480	"
4 Teachers, total salary		2,900	
11 Employees, "		2,136	
		$7,166	

These salaries appear entirely reasonable, and the committee are satisfied that, although everything needful is done to make these pupils comfortable, yet there is no extravagance, and the utmost care seems to be taken to secure economy in every department. The genial and worthy superintendent, and his accomplished lady, who is the matron, appear to be untiring in their kindness, and with singleness of purpose devote their time and talents to maintain good order, and exert a truly parental influence over the school.

So far the institution seems to have fully answered the beneficent purposes intended in its creation; and it is a gratifying fact that, for several years past, no blind person, of suitable age to be instructed, has been refused admission. There is not the same difficulty in ascertaining the number of blind in the state, as was experienced in enumerating the insane. The census of 1860 shows that there were then 475 blind persons in the state; and that of that number there were but nine under five years; 26 between five and ten; 29 between ten and fifteen, and 53 between fifteen and twenty. There were 83 between twenty and thirty, and 64 between thirty and forty, and 40 between forty and fifty years.

Of the 80 in the institution in January last, three were nine years old; 53 between ten and twenty years; 23 between twenty and thirty years, and one forty years. Of the 82 in the institution December 3, 1867, there were four aged nine years; eight aged ten years, and three aged eleven years. Forty-four were females, of an average age of fifteen and three-seventh years; thirty males, in literary department, of average of fourteen years, and eight males learning the broom trade, of average of twenty-four years.

Referring to the statistics of the deaf and dumb, it will be seen that the average age of the blind is considerably greater than the deaf and dumb, in school; and after making allowance (by increase of population) of the number of the blind, from 1860, it is evident that the number of this class in the state is far less than deaf and dumb; and is accounted for, principally, from the fact that blindness arises more especially as a consequence of disease and exposure of adult life, and from age, while deaf-muteism is generally a consequence of diseases of childhood.

ALLEN C. FULLER,
ANDREW J. HUNTER,
ELMER BALDWIN,
T. B. WAKEMAN.

The following tabular statement shows the number admitted, and the number now in attendance, by counties, respectively:

Counties.	Total admitted.	Number present	Counties.	Total admitted.	Number present
Adams	8	...	Gallatin	2	....
Alexander	2	....	Greene	8	8
Bond	1	...	Grundy	....	....
Boone	4	1	Hamilton	1	....
Brown	3	....	Hancock	2	1
Bureau	1	1	Hardin	1	....
Calhoun	2	....	Henderson	....	...
Carroll	2	1	Henry	1	....
Cass	3	1	Iroquois	....	....
Champaign	1	1	Jackson	3	1
Christian	4	3	Jasper	....	....
Clark	....	....	Jefferson	3	....
Clay	2	1	Jersey	4	3
Clinton	....	....	Jo Daviess	2	....
Coles	....	....	Johnson	1	....
Cook	25	6	Kane	3	1
Crawford	3	1	Kankakee	1	....
Cumberland	2	....	Kendall	2	2
DeKalb	2	....	Knox	5	1
DeWitt	1	....	Lake	4	2
Douglas	1	....	LaSalle	3	1
DuPage	2	....	Lawrence	2	...
Edgar	3	1	Lee	....	...
Edwards	....	....	Livingston	1	1
Effingham	....	....	Logan	3	1
Fayette	3	1	Macon	3	....
Ford	...	....	Macoupin	9	4
Franklin	3	....	Madison	4	1
Fulton	4	....	Marion	6	1

Counties.	Total admitted.	Number present.	Counties.	Total admitted.	Number present.
Marshall	3	2	Saline	1	....
Mason	7	3	Sangamon	10	7
Massac	....	....	Schuyler	1	....
McDonough	2	....	Scott	5	....
McHenry	2	....	Shelby	2	1
McLean	7	1	Stark	2	....
Menard	2	1	St. Clair	3	1
Mercer	3	....	Stephenson	6	4
Monroe	3	1	Tazewell	4	2
Montgomery	....	....	Union	2	....
Morgan	12	4	Vermilion	3	....
Moultrie	....	....	Wabash	1	....
Ogle	2	....	Warren	....	....
Peoria	3	2	Washington	....	....
Perry	3	...	Wayne	3	1
Piatt	....	....	White	7	6
Pike	15	3	Whiteside	3	....
Pope	....	....	Will	6	....
Pulaski	....	....	Williamson	....	....
Putnam	1	1	Winnebago	5	1
Randolph	3	....	Woodford	....	....
Richland	2	....			
Rock Island	4	....	Total	301	83

REPORT OF JOINT COMMITTEE.

The foregoing reports and evidence and papers relating thereto, having been referred to the Committee on State Institutions of the House, said Committee would respectfully report that the *evidence* relates solely to the management of the Hospital for the Insane, and that the report of the committee of investigation contains a fair and substantial abstract of so much of said evidence as appears necessary to an understanding of the subjects of the investigation.

From an examination of said reports and evidence, we are satisfied that the investigation was thorough and impartial, and adopt the conclusions arrived at by said investigating committee.

February 20, 1869.

H. C. Childs, *Chairman*
Samuel Wiley,
Geo. Gaylord,
Charles G. Reade,
E. H. Talbott,
C. W. Marsh,
Geo. W. Parker,
A. Kinyon,
N. R. Casey,
John W. Ross,
S. R. Saltonstall,
Jos. Cooper,

Committee on State Institutions of the House.

The undersigned, Committee on State Institutions of the Senate, in compliance with a joint resolution of this General Assembly, directing them to report an abstract of the testimony